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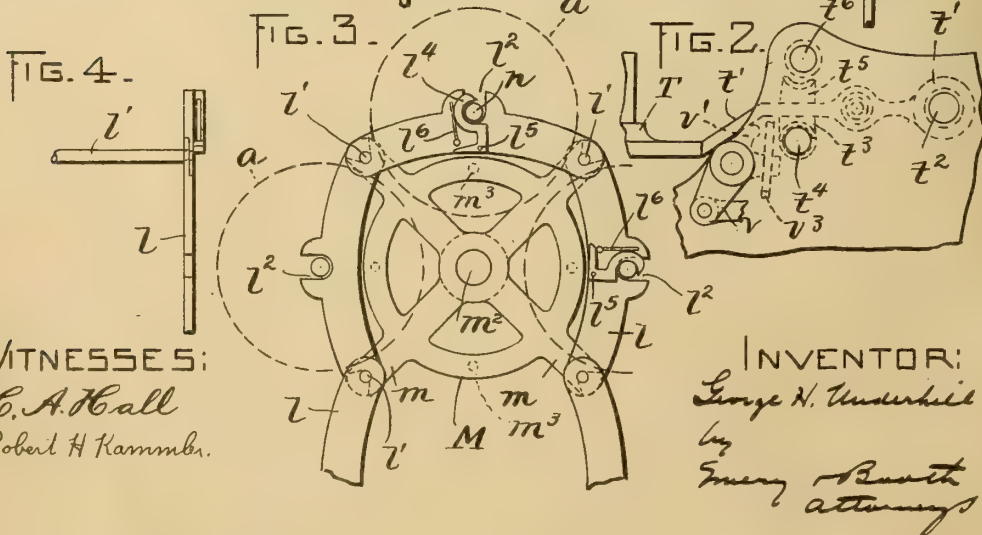
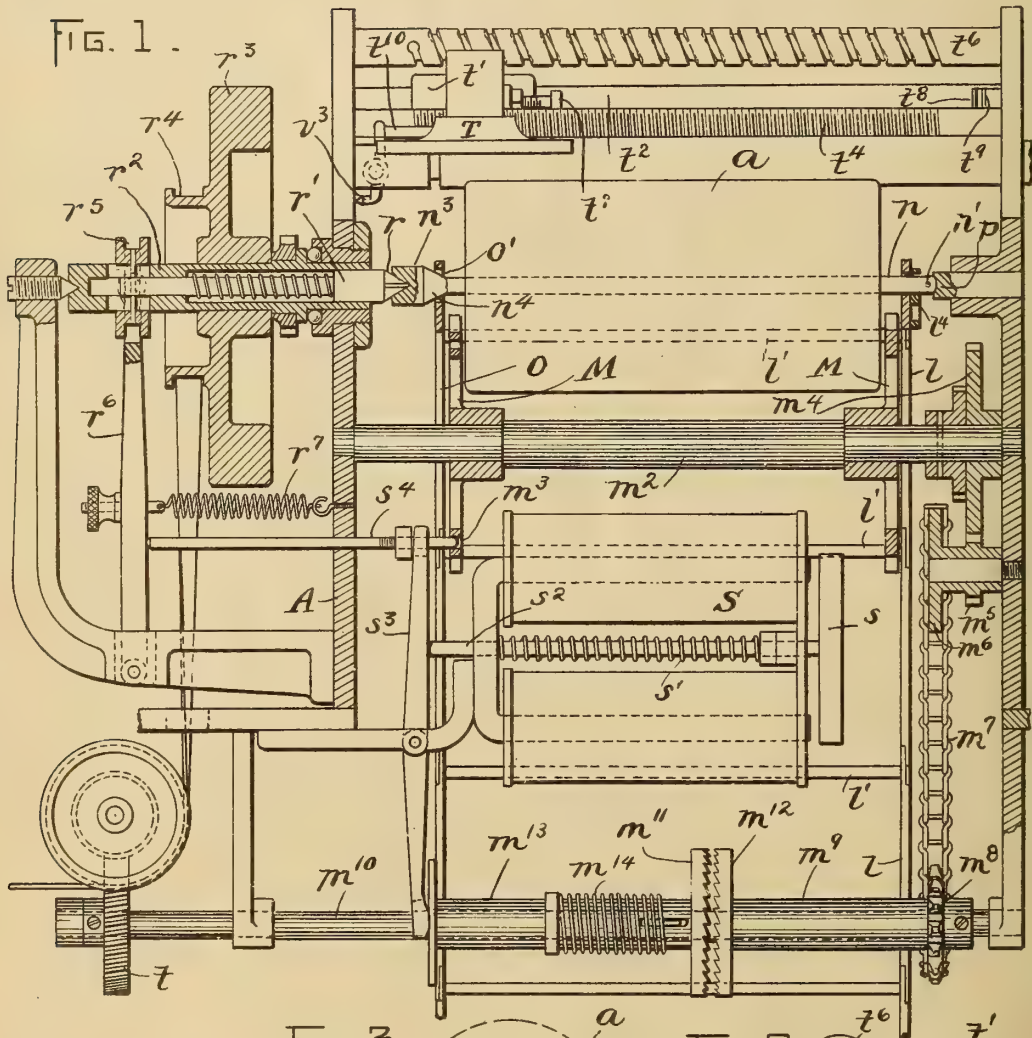
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G. H. UNDERHILL.
 PHONOGRAPH.
 APPLICATION FILED FEB. 21, 1906.

980,459.

Patented Jan. 3, 1911.



UNITED STATES PATENT OFFICE.

GEORGE H. UNDERHILL, OF BOSTON, MASSACHUSETTS.

PHONOGRAPH.

980,459.

Specification of Letters Patent.

Patented Jan. 3, 1911.

Application filed February 21, 1906. Serial No. 302,196.

To all whom it may concern:

Be it known that I, GEORGE H. UNDERHILL, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Phonographs, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention relates to sound-reproducing or sound-recording machines. While many features thereof have useful application to other types of such machines, and to those employing but a single record, my invention is particularly applicable and is here illustrated with reference to one type of multiple record machine employing a plurality of cylindrical records adapted automatically and successively to be brought into reproducing or recording relation with reference to suitable reproducing or recording mechanism, the latter being caused automatically to traverse the face of each record as the same is presented.

My invention will be best understood by reference to the following description when taken in connection with the accompanying illustration of one specific embodiment thereof, which it will be understood represents but a single form, while its scope will be more particularly pointed out in the appended claims.

In the drawings,—Figure 1 is a central, vertical section, partially broken away, showing the principal operating parts of a phonograph embodying one form of my invention; Fig. 2 is a partially broken away end elevation showing the support and traversing mechanism for the sound box; Fig. 3 is a side elevation showing the flexible linked record carrier and its relation to the driving sprockets of the machine, and Fig. 4 is an end view of the same linked carrier.

In the drawings, for illustrative purposes, I have shown the various features of my invention embodied in a multiple record phonograph employing a series of record cylinders *a*, which may be of any usual or ordinary type. The term "phonograph" I herein employ in its generic sense to signify a machine of any type for producing or re-

producing sounds, it being immaterial whether such machine is of the graphophone or gramophone type or whether it employs cylindrical, disk or other records.

The specific type of machine here shown is provided with a record holder, which may be of any suitable type or construction but which is shown as of the linked or chain type, comprising two chains or sets of jointed links, in the individual links of which are held the several records of the series.

One chain is constructed of a series of similar links *l*, which may be and herein are jointed by means of rods *l'*, each of which extends across to a corresponding and opposite joint in the other chain. The several rods are adapted to engage with the forked arms *m* of the two sprockets *M, M*, mounted upon the sprocket shaft *m*², the latter journaled in the machine frame *A*, so that the linked holder is sustained by the sprockets and carried about as the sprocket shaft is turned.

The link *l* has an open pocket or depression *l*² formed on its upper edge in which one end of the mandrel shaft *n* is adapted loosely to rest, the semi-circular bottom of the pocket being of appreciably greater diameter than the diameter of the shaft. A pin *n'* in the overhanging end of the shaft prevents lateral withdrawal thereof in one direction.

The other chain member is composed of links *o*, jointed as are the links *l*, but having in place of the open pockets, apertures *o*², also of greater diameter than the diameter of the mandrel shaft. The latter at its end nearest to the link *o* terminates in an enlarged head *n*³ of greater dimensions than the aperture *o*², there being provided between the shaft and the enlarged head an abruptly tapered portion *n*⁴.

Each mandrel when placed upon the carrier is effectually held against longitudinal displacement by the pin *n'* at one end and the enlarged head *n*³ at the other, the latter, however, permitting a comparatively free lateral or swinging movement of the mandrel upon the head as a fulcrum. At the opposite end however, the mandrel shaft is normally held against swinging movement by the

retaining hook l^4 , which is pivoted (Fig. 3) upon the link at l^5 and pressed forward by the light spring l^6 to overlie the end of the mandrel shaft. The shaft end is therefore readily released when the hook is forced backward, leaving the mandrel free to be swung away from the linked carrier for the withdrawal of its record if desired. The shaft end is replaced by merely snapping in the end of the shaft against the inclined end of the hook to force the latter open. For withdrawal, a sharp quick pull on the mandrel shaft will also open the hook.

When the record is in position (see Fig. 1) one end of the mandrel shaft is seated in the step bearing p , which is slightly cupped to receive the shaft end and retain it in position. This bearing is shown stationary but, if desired, the same might itself be journaled in ball or other frictionless bearings acting thereby to reduce the friction of the machine.

At its opposite end the enlarged end of the mandrel shaft is recessed to receive the winged point r upon the head of the driving shaft r' , which latter is constantly driven through the sleeve r^2 , in which the driving shaft is mounted for axial sliding movement, although keyed or pinned thereto to rotate therewith. To the sleeve is secured the fly wheel r^3 and driving pulley r^4 , the latter having a connection by a belt with any suitable source of driving power. The fly wheel tends to keep constant the speed of rotation of the driving shaft by being clutched to and unclutched from successive records, tending therefore to start up the new record instantly at its normal speed. The outer end of the driving sleeve r^2 has the grooved collar r^5 , which is attached to the driving shaft r' by a pin working in a slot in the sleeve, so that the collar turns with the latter, but may be moved longitudinally to cause the longitudinal clutching or unclutching of the driving shaft. The sprocket and chain-carrier have a position of rest such that a record is then held, as shown in Fig. 1, in approximately its operative position and in a position to have its mandrel shaft engaged by the driving shaft. In that position as shown the winged head r of the driving shaft engages the recessed or socketed end of the mandrel shaft, forcing the opposite end of the shaft into the cupped bearing p and lifting the shaft substantially free from contact with the chain carrier. The mandrel shaft is then supported at one end by the bearing p and at the opposite end by the head of the driving shaft which holds it in suitable and accurate alinement for cooperation with the sound box and stylus, and simultaneously imparts thereto the necessary rotary movement.

When the sound box reaches the end of its

travel, by means hereafter referred to, it is elevated and returned to its initial position. Simultaneously, the record is released by the driving shaft and restored to the carrier and the sprocket is given a partial revolution, sufficient to bring a fresh record into its approximate operative position, whereupon the fresh record is in turn engaged by the driving shaft and presented to the stylus.

For the purpose of releasing and shifting the records, the sound box or its arm is caused to complete an electric circuit, energizing the controlling magnet S , which is shown (Fig. 1) placed beneath the sprocket shaft in a central location. The energization of the magnet attracts its armature s , normally retracted by the spring s' . This forces the armature rod s^2 against the upright pivoted lever s^3 , causing the latter to withdraw the horizontal locking bar s^4 from the locking aperture m^3 in the face or side of the sprocket M . Simultaneously, the driving shaft r^1 is withdrawn from clutching engagement with the enlarged socket of the mandrel shaft by pressure of the opposite end of the locking rod against the upright pivoted lever r^6 , which is connected to move the grooved collar r^5 outwardly and release the record.

The moment the record is released by the clutching head of the driving shaft, the tapered portion n^4 upon the mandrel shaft engages with the aperture of the link and slides or withdraws the mandrel out of the cupped bearing p , so that the shaft when restored to its seat on the carrier is entirely clear of its end support and free to advance with the carrier or holder.

The record having been restored to the carrier and the sprocket released, the sprocket shaft is free to be turned by mechanism to be described, the clutch shaft in the meantime being held retracted by the latch rod s^4 , the latching end of which remains pressed against the face of the sprocket until the sprocket is turned far enough to bring the next locking aperture in registration therewith, which does not occur until the next record has advanced to the desired position.

The sprocket shaft is turned through engagement of the gear m^4 and the pinion m^5 , the latter being mounted upon a sleeve with the sprocket m^6 , which is driven through the chain m^7 and sprocket wheel m^8 from the counter-shaft sleeve m^9 . The latter is mounted upon the counter-shaft m^{10} and constantly driven through suitable and appropriate gearing t and is adapted to be clutched to or unclutched from the counter-shaft by means of engagement between the movable clutch member m^{11} and a clutch member m^{12} . The latter is secured to the sleeve m^9 , while the movable clutch member is secured to a sleeve m^{13} slidably mounted

upon the counter-shaft but keyed thereto and provided with a spring m^{14} which acts to retract the clutch member from engagement. When the magnet S is energized, a depending end of the upright lever s^3 throws the sleeve m^{13} over against the spring m^{14} and clutches the counter-shaft sleeve m^9 to the rotating counter-shaft, thereby causing the turning of the sprockets. The movement of the sprocket shaft continues until the locking rod s^4 enters the next aperture, whereupon the spring m^{14} disengages the clutch. The same movement of the locking rod frees the upright rod r^6 which under influence of the spring r^7 forces the driving shaft into engagement with the mandrel shaft of the fresh record lifting the latter from the chain and alining it in operative position.

The sound box, stylus and attached parts may be of any usual or suitable construction and the same are not here shown in detail. The sound box T, however, is secured to the arm t' , mounted to slide upon the rod t^2 . For its forward movement the arm has a nut t^3 adapted to engage the finely threaded screw t^4 when the arm is depressed. The arm, however, is also provided with a second nut t^5 , adapted to engage with the overlying coarse threaded return feed screw t^6 when the arm is swung slightly upward. The two feed screws are given a constant and suitable rotary movement by gearing (not shown) driven from the sleeve r^2 .

During forward movement of the sound box, the arm is depressed and engages the finely threaded feed screw. When the stylus nears the end of the record an adjustable contact screw t^7 (Fig. 1) carried by the arm causes a spring contact t^8 to touch the contact t^9 and complete an electrical circuit for energizing the controlling magnet S. Completion of this circuit also energizes a second magnet (not shown), the armature of which is connected to the lever v (Fig. 2), movement of which swings the cam shelf v' upward. The latter underlies the sound box arm and causes elevation of the sound box and stylus and its engagement with the coarse threaded return feed screw. A swinging spring-pressed pin v^3 (Fig. 1) pivoted at the end of the cam shelf snaps into a depression in the adjacent machine frame when the shelf is elevated and there maintains it until the sound box has returned to its initial position, whereupon a projection v^2 upon the sound box arm is caused to strike the pin and withdraw it from the machine frame, permitting the shelf to drop and lower the sound box and stylus into engagement with the new record, which in the meantime has been advanced.

Obviously, various other ways of controlling the movement and action of the sound

box, as well as the automatic operation of the various parts, may be employed, this specific form of machine being submitted for illustrative purposes only.

Since the mandrel shafts require no positive alinement upon the links of the machine, as has heretofore been the case in linked carriers, the individual links may be made of cheap construction and, if desired, stamped out of sheet metal, thereby considerably lessening the cost of a machine of this type.

While I have shown and described a machine embodying one form of my invention, it is to be understood that the latter is not limited to the specific details or form or relative arrangement of parts here shown, but extensive deviations therefrom may be made without departing from the spirit of the invention.

Claims—

1. A phonograph having a linked carrier for loosely holding a record and record-rotating means for engaging a record freeing it from said carrier and alining it in operative position.

2. A phonograph having linked record-holding means and record rotating means for freeing it from the holding means.

3. A multiple record phonograph having a chain carrier for loosely holding a plurality of records, and record-rotating means for successively engaging the several records freeing each from the carrier and alining it in operative position.

4. A multiple record phonograph having flexible means for holding a plurality of records, and record-rotating means for successively freeing the records from the holding means and alining each in operative position.

5. A phonograph having flexible holding means for holding a record, and record-supporting means adapted to free the record from the holding means and support the same in operative relation to the sound producing mechanism.

6. A phonograph having flexible holding means for holding a record, and a rotary support adapted to move to engage with the record and free the same from the holding means.

7. A phonograph having a chain carrier for holding a plurality of records, and supporting means for rotatably holding a record in playing position, means for causing said records successively to pass between said supporting means while still on the carrier, and means for there freeing a record from the carrier and there alining it in operative position.

8. A multiple record phonograph employing a chain record holder, the latter comprising a plurality of links and having openings to receive the record mandrels, said

openings being of greater diameter than the diameter of the mandrels and means to free successive record mandrels from the holder.

9. A multiple record phonograph having
5 a flexible record carrier in which the record mandrels are held loosely, means for bringing successive records substantially into operative position, and end engaging means for freeing the records from the carrier and

rotating them without substantial change of position.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

GEORGE H. UNDERHILL.

Witnesses:

THOMAS B. BOOTH,
EDITH E. CHAPMAN.

W. W. YOUNG.
 METHOD OF MAKING TALKING MACHINE DIAPHRAGMS.
 APPLICATION FILED DEC. 12, 1908.

980,470.

Patented Jan. 3, 1911.

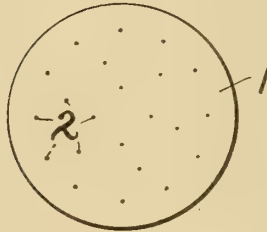


FIG. 1.

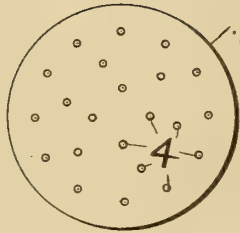


FIG. 2.



FIG. 3.

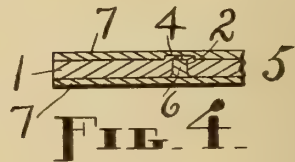


FIG. 4.

WITNESSES:
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INVENTOR.
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 BY *Webster & Co.,*
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UNITED STATES PATENT OFFICE.

WILLIAM W. YOUNG, OF SPRINGFIELD, MASSACHUSETTS.

METHOD OF MAKING TALKING-MACHINE DIAPHRAGMS.

980,470.

Specification of Letters Patent.

Patented Jan. 3, 1911.

Application filed December 12, 1908. Serial No. 467,225.

To all whom it may concern:

Be it known that I, WILLIAM W. YOUNG, a citizen of the United States of America, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented a new and useful Method of Making Talking-Machine Diaphragms, of which the following is a specification.

My invention relates to improvements in methods of manufacturing reproducing diaphragms for talking-machines.

Broadly the new method consists in perforating thin sheet material, and when deemed necessary in producing burs thereon by punching instead of cutting out the perforations, and if desired in upsetting such burs.

More specifically the new method may consist in perforating imporous material, in filling the perforations in the imporous material and in coating the latter with a material or materials, while in a liquid state or plastic condition, which possess the necessary characteristics and qualifications or qualities, in partially drying the imporous material thus treated, and in subjecting the same to pressure. The coating, drying and pressing operations in the order named are usually repeated one or more times and a thorough and complete drying by subjection to heat is given after pressing.

It will thus be seen that my invention contemplates the progressive method whereby is produced a perforated diaphragm of thin material which may or may not have flattened burs thereon and which may or may not have a filling and coating material or materials in its perforations and on one or both of its sides. Or, to state it differently, it may be said that initially a diaphragm is produced which consists of thin, perforated material either with or without burs thereon and if with burs then either with or without them in a flattened condition, but by adding the filling and coating and taking the additional steps for that purpose the afore-said diaphragm consisting of one material is converted and transformed into a diaphragm consisting of different materials, the structure of the first being homogeneous and that of the second heterogeneous.

With the mica and the ordinary sheet metal, reproducing diaphragms commonly used in talking machines, it has not been possible to obtain the best results from such

machines, because neither of these diaphragms is capable of producing such results; moreover, the mica diaphragms or disks, which greatly exceed in number the ordinary sheet-metal diaphragms or disks, are very fragile and also expensive since there is a great waste incident to procuring disks of the proper size and character; the mica disks, too, deteriorate with use; the primary object of my invention, therefore, is to produce a substitute for mica, ordinary sheet-metal, and other kinds of diaphragms heretofore employed, which substitute is durable and does not deteriorate, is resilient and resonant, is impervious to moisture and unaffected by climatic changes especially when coated, and is capable of giving out clear, loud, and distinct tones of great depth and volume, of evenly distributing the sound waves and making a quick, complete, and perfect recovery, and of lessening to a great extent all alien and discordant noises such as blasts and scratching sounds which are so prevalent with the ordinary diaphragm.

In the accompanying drawings, which form a part of this application and in which like characters of reference indicate like parts through the several views—Figure 1 is a side view of a sheet metal disk perforated and represents the unfilled diaphragm; Fig. 2, a view of a diaphragm as it appears when the burs left by the perforating punch have been upset or pressed into small bosses and when seen from the side upon which such bosses are located, the appearance being practically the same whether said diaphragm be filled and coated or not provided that, in the former instance, the coating be transparent; Fig. 3, an enlarged fragment in section of the disk or diaphragm shown in the first view, and, Fig. 4, an enlarged fragment in section of a diaphragm which has been filled and coated and pressed.

Although it is my practice to make the diaphragms out of individual disks, the process might be applied to strips or sheets of material which are afterward cut up into disks.

Various kinds of metals and their alloys which have been rolled or otherwise made thin can be utilized in the manufacture of my improved diaphragms, among which mention may be made of aluminum and copper, the former being an exceedingly good metal for the purpose. In addition to sheet metals other materials which are sufficiently

hard and dense and possess the other necessary qualities to a greater or less degree may be used, the materials being imporous when they are to be filled and coated.

5 In carrying out my method I take a disk 1, of aluminum for example, and make a number of small holes 2 therein. The holes 2 are more or less numerous, they extend through the disk 1 from side to side, and
10 they are preferably punched rather than cut so as to leave projections or burs on one side of said disk, as shown at 3, in Fig. 3. The object of perforating the disk, and more especially of perforating it in the manner
15 just stated, is for the purpose of breaking up the structure of the same and of obtaining the small bosses which are formed by flattening the aforesaid burs, as will presently be made clear, such changes in the character of
20 the original disk being productive of beneficial results. A further object of the perforations may be to afford means for producing a structure of different materials, or a structure that consists of unlike parts in texture, as is done when the perforations are
25 subsequently filled. This last phase of the invention will be dealt with at length in the course of this description.

In some cases the burs 3 may be left intact, but usually they will be upset to form small, flat bosses 4, Figs. 2 and 4, on one side of the disk 1 at the corresponding ends of the holes 2. In reality, the bosses 4 are necessarily somewhat irregular in shape, and
35 the openings in their centers are often so exceedingly minute as scarcely to be discernible, but of course the metal, which has been perforated by punching, when subjected to pressure in the upsetting process
40 does not return to its former place or condition. In the drawings the holes 2, burs 3, and bosses 4 are on an exaggerated scale. The disk 1 is pressed between steel plates or their equivalent to flatten the burs 3 into the
45 bosses 4.

In order to produce a more complex and perhaps in some respects better diaphragm than that previously described, I have recourse to the method which I will now explain, and in carrying out which I make use
50 of one or more suitable chemical substances or materials for a filling and coating agent for the perforated disk 1. Any material or materials which will give the desired results
55 may be employed for the aforesaid filling and coating, such as soluble minerals like plaster-of-paris, oxid of zinc, silicate of soda, etc., but I do not intend to be restricted in this particular: neither do I intend to be
60 limited to the exact sequence or number of steps in putting said method into practice, since good results may be obtained even though some little departure be made in the order or number, or both, of such steps.

65 Assuming now, that the disk 1 has been

perforated by punching, and that a filling and coating compound, solution, mixture, or emulsion of silicate of soda or silicate of potash and oxid of zinc, for example, has
70 been prepared, the next step is to introduce such filling and coating emulsion into the holes 2 and to spread it on one or both sides of said disk, generally on both sides. The disk, after being treated as above set forth
75 is next dried or rather partially dried, then the filled and coated disk is pressed between the steel plates or equivalent mediums, of which mention already has been made, in order to transform the burs 3 into the bosses
80 4 and to compress the filling and coating material or agent within the holes 2 and on the outside of the disk. Following the pressing the disk is dried by being subjected to heat. One or more additional coats of
85 the emulsion are usually given the disk, after the foregoing steps have been taken, the application of such coats being followed preferably by the partial drying, the pressing, and the thorough drying by subjection
90 to heat. By subjecting the filled and coated diaphragm to heat at a certain stage or stages during the process of making the same and especially after the final pressing, all moisture is driven out and the compound,
95 mixture, solution, or emulsion which constitutes the filling and coating material is rendered hard and otherwise fit to serve its purpose. In the end a diaphragm 5, Fig. 4, is produced which possesses the necessary
100 and desired qualities. In this view the filler is represented at 6 and the two coats at 7. By following this method any number of diaphragms may be produced and all will be of a similar nature.

When the burs 3 are flattened the substance of the disk 1 is forced partly into the
105 adjacent ends of the holes or perforations 2 and into the filling when present, but enough remains outside to form the bosses 4.

The several partial and complete dryings before and after pressing are effected by exposing the treated material to different
110 degrees of temperature such as will bring about the required result in each case. The last drying after pressing, whether the latter operation be repeated or not, should be very thorough and complete in order that
115 no moisture whatever shall be left in the finished diaphragm. It is generally better to dry after each pressing, provided there
120 be more than one, but in any event there should be a final drying, as stated above; it is well to dry after the first pressing also, when there is a subsequent pressing or pressings.
125

Air drying at an ordinary temperature might do for the partial drying, but would be slow, so I make use either of an open or closed heater of some kind in connection
130 with this step of my method, and also for

the complete drying, the open heater being employed as a general thing for both unless the drying is to amount to an actual baking which with these diaphragms is not deemed
5 to be necessary or desirable even.

It has been found that diaphragms made by treating wire-mesh, -cloth, or -gauze in the manner hereinbefore explained give fairly good results. In this case the perforations are in the base medium or disk to start with, and there are no bosses, but otherwise the steps and the resulting product are substantially the same as before.

What I claim as my invention, and desire
15 to secure by Letters Patent, is—

1. The method of manufacturing diaphragms, for talking-machines, consisting in punching holes in thin sheet metal and in so punching them as to form burs around
20 such holes at one end of each, and in upsetting said burs.

2. The method of manufacturing diaphragms, for talking-machines, consisting in punching holes in thin sheet metal and in so punching them as to produce burs around such holes at one end of each, and in pressing said burs back into said holes and at the same time flattening them around the latter to form bosses on the adjacent surface
25 of said material.

3. The method of manufacturing diaphragms, for talking-machines, consisting

in perforating a piece of imporous material, in introducing filling material into the perforations in said imporous material and
35 coating the latter with such filling material, and in drying and pressing the treated piece of imporous material.

4. The method of manufacturing diaphragms, for talking-machines, consisting
40 in punching holes in a piece of imporous material and in so punching them as to produce burs around such holes at one end of each, in introducing filling material into said holes and coating such perforated material with such filling material, in drying
45 the treated piece, and in pressing the same to flatten the burs left by the punching operation and to compress the filling material in and on said piece.

5. The method of manufacturing diaphragms, for talking-machines, consisting in introducing filling material into imporous perforated material and coating such imporous material with such filling material,
50 in partially drying the treated imporous material, in pressing the same, in subjecting it to heat, and in again coating, partially drying, pressing, and subjecting to heat.

WM. W. YOUNG.

Witnesses:

F. A. CUTTER,

A. C. FAIRBANKS.

N. S. WAKEFIELD.
 DIAPHRAGM FOR SOUND REPRODUCERS.
 APPLICATION FILED JAN. 31, 1910.

980,713.

Patented Jan. 3, 1911.

Fig. 1.

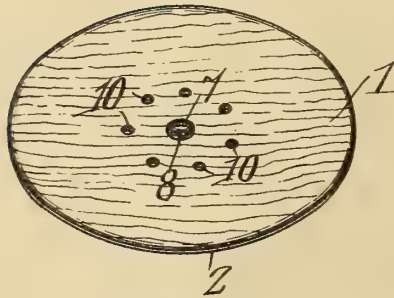


Fig. 2.

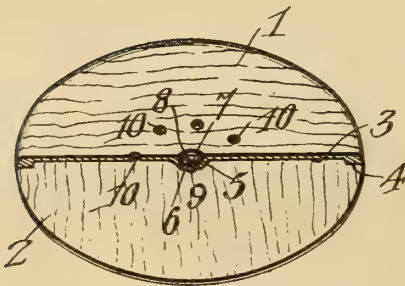


Fig. 4.

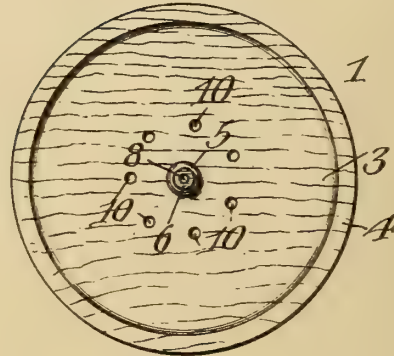


Fig. 3.

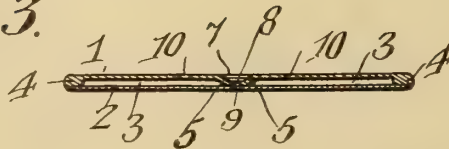
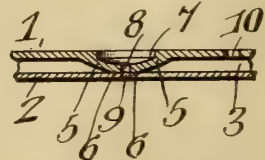


Fig. 5.



Nathan S. Wakefield, Inventor

Witnesses

Jas. E. McLaughlin

C. Bradway.

By

E. G. Siggers

Attorney

UNITED STATES PATENT OFFICE.

NATHAN STOWELL WAKEFIELD, OF LOS ANGELES, CALIFORNIA.

DIAPHRAGM FOR SOUND-REPRODUCERS.

980,713.

Specification of Letters Patent.

Patented Jan. 3, 1911.

Application filed January 31, 1910. Serial No. 541,201.

To all whom it may concern:

Be it known that I, NATHAN STOWELL WAKEFIELD, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Diaphragm for Sound-Reproducers, of which the following is a specification.

This invention relates to a diaphragm designed especially for phonographs, telephones, or other sound-reproducing instruments, and the principal object of the invention is the provision of an extremely simple and inexpensive diaphragm possessing superior sound-reproducing properties.

Another object of the invention is to provide a diaphragm of the chambered type consisting of a novel arrangement of disks fastened together to form a unitary structure, and so designed as to reproduce the delicate tones or sound shades as well as accurately reproducing the volume and register of the original sound without the disagreeable, harsh metallic sounds as is the case with diaphragms commonly in use.

With these objects in view and others, as will appear as the description proceeds, the invention comprises the various novel features of construction and arrangement of parts which will be more fully described hereinafter and set forth with particularity in the claims appended hereto.

In the accompanying drawing, which illustrates one embodiment of the invention, Figure 1 is a perspective view of the diaphragm. Fig. 2 is a perspective view showing the inner disk of the diaphragm in section. Fig. 3 is a diametrical section of the diaphragm. Fig. 4 is a plan view showing the inner face of the inner disk. Fig. 5 is an enlarged sectional view of the central portion of the diaphragm.

Similar reference characters are employed to designate corresponding parts throughout the views.

The diaphragm is made of two comparatively thin disks or plates 1 and 2 of wood or other suitable material, which are permanently secured together, by gluing or otherwise, according to the material used, to constitute a unitary structure. The disk 1 forms the side of the diaphragm that is presented to the chamber of the sound box or the sound reproducing device, while the disk 2 is disposed at the outside next to the stylus carrying arm. One of the disks, pref-

erably the inner disk 1, has its inner face cut out to form a shallow chamber 3. This operation can be performed in a turning lathe, and the cut is made from a point inwardly from the periphery to a point adjacent the center of the disk, whereby a peripheral flange 4 and a central hub 5 will be left. The disk 2 is perfectly flat, both on its inner and outer surfaces, and is connected with the disk 1 by being glued to the flange 4 and hub 5. As shown in Fig. 5, the hub has a flat face 6 for providing a substantial area to which the disk 1 can be fastened. The outer face of the disk 1 is provided with a depression 7 directly at the hub 5, and the bottom of this depression is provided with an aperture 8 registering with an aperture 9 in the disk 2 for receiving the screw which attaches the diaphragm to the stylus-carrying arm. The hub 5 has a three-fold function, in that it mechanically connects the two disks together at the center, forms a sound post between the disks, and prevents the screw from being tightened to such an extent as to crack the disks in fastening the diaphragm to the stylus-carrying arm. The chamber disk 1 is provided with a plurality of apertures 10 adjacent to and concentrically arranged around the hub for the purpose of permitting the sounds to be carried from the diaphragm into the machine or sound box by the vibration of the diaphragm, which feature, together with the sounding post formed by the hub, conduce to the reproduction of clear, round tones. When the diaphragm is made of wood, it is preferable to glue the disks together with their grains extending transversely to each other so that one disk will serve to strengthen the other. Since the disks are connected together, both at the center and edge of the diaphragm, a comparatively durable article is produced, and one having a minimum thickness considering the box-like form.

From the foregoing description, taken in connection with the accompanying drawing, the advantages of the construction and of the method of operation will be readily apparent to those skilled in the art to which the invention appertains, and while I have described the principle of operation of the invention, together with the device which I now consider to be the best embodiment thereof, I desire to have it understood that the device shown is merely illustrative, and

that such changes may be made when desired as are within the scope of the claims appended hereto.

Having thus described the invention, what I claim as new, and desire to secure by Letters Patent, is:—

1. A chambered diaphragm for sound-reproducing devices consisting of a pair of parallel flat-thin disks permanently secured together both at the center and periphery.

2. A diaphragm for sound-reproducing devices consisting of a pair of parallel flat-thin disks permanently secured together at the center and around the periphery, one of the disks being chambered and having a plurality of apertures opening from the chamber.

3. A diaphragm for sound reproducers consisting of a flat disk having one side hollowed out in the form of a shallow chamber surrounded by a peripheral flange, and a second disk bearing flat against the flange and rigidly secured thereto, one of the disks

having a central hub forming a sounding post against which the other disks bears, the said hub and the disk bearing against the same being adapted to have a fastening means inserted therethrough for connecting the disks in fixed spaced relation and securing them to a support.

4. A diaphragm for sound reproducers consisting of a pair of flat parallel disks, one of the disks having a flat annular flange bearing against the inner face of the other disk and one of the disks having a central hub bearing flat against the opposed face of the other disk, the outer face of the disk having the hub being depressed within the area of the hub to receive a securing device.

In testimony, that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

NATHAN STOWELL WAKEFIELD.

Witnesses:

CLAUDE MYERS,

LOUIE WOODWORTH.

W. HESS, JR.
TALKING MACHINE HORN.
APPLICATION FILED JULY 9, 1906.

981,648.

Patented Jan. 17, 1911.

2 SHEETS—SHEET 1.



FIG 1

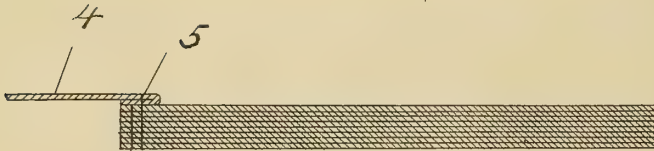


FIG 2

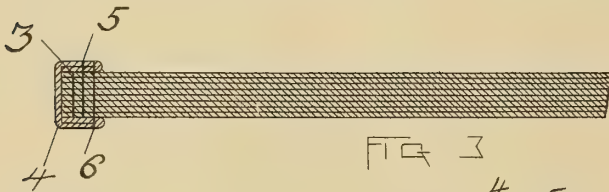
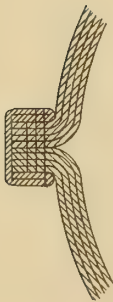
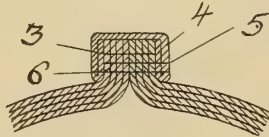


FIG 3



WITNESSES

J. L. Fuller.
J. Donsbach.



FIG 4

INVENTOR

Wendell Hess Jr.
By Mosher & Curtis
Attys

W. HESS, JR.
TALKING MACHINE HORN.
APPLICATION FILED JULY 9, 1906.

981,648.

Patented Jan. 17, 1911.

2 SHEETS—SHEET 2.

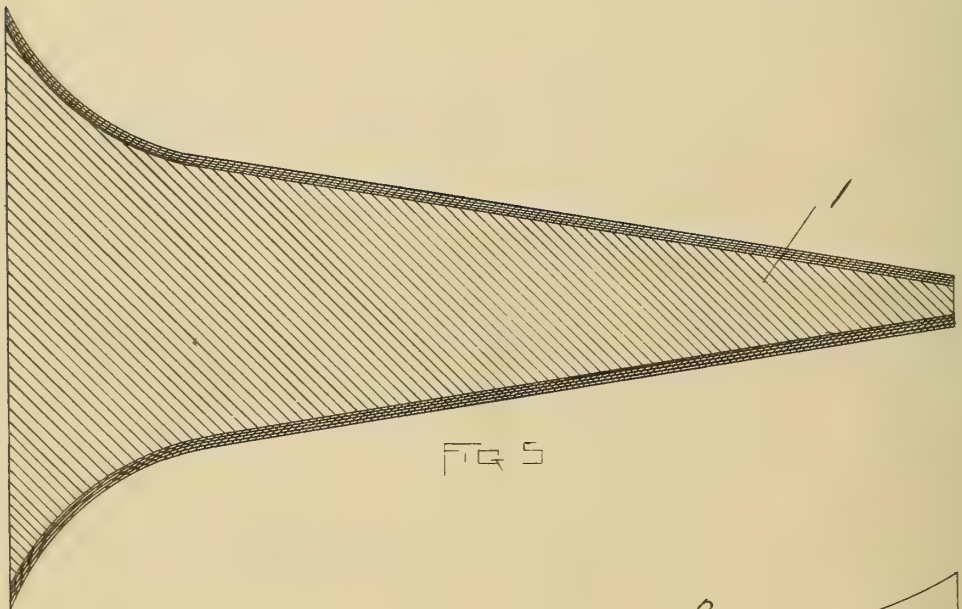


FIG 5

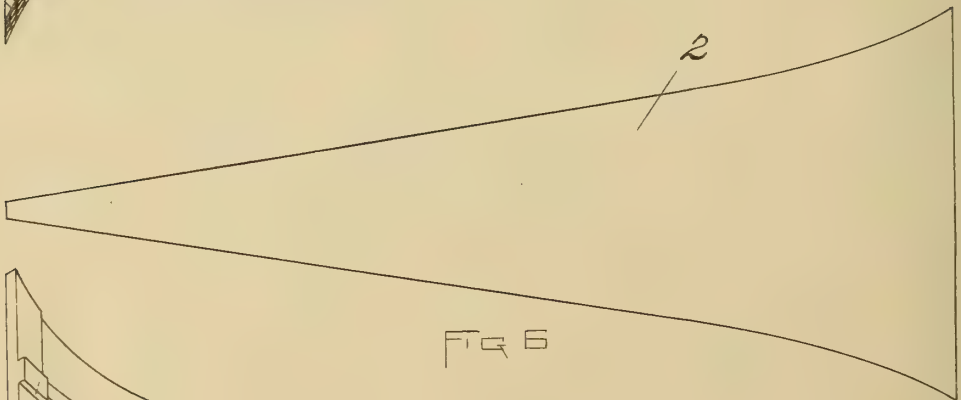


FIG 6

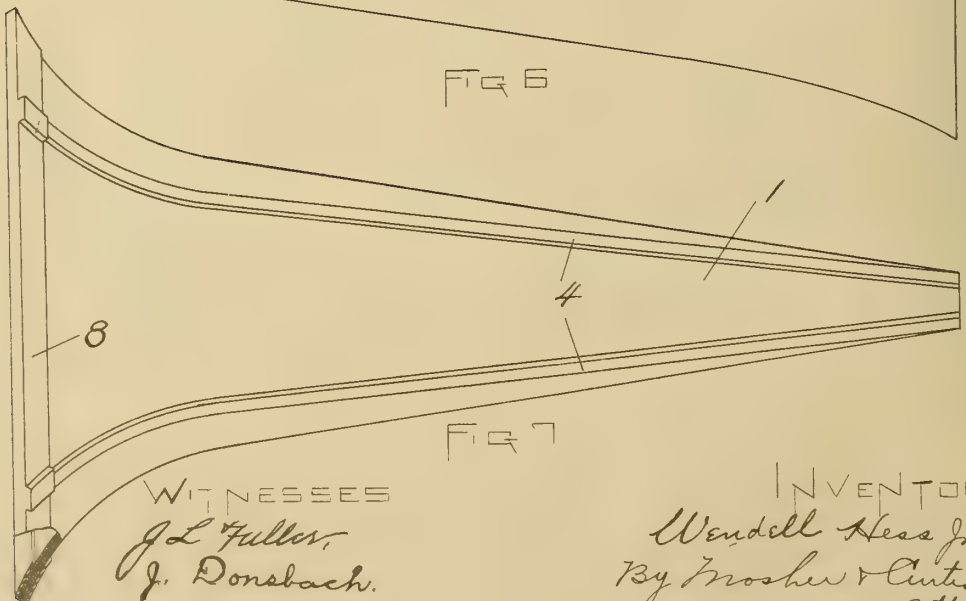


FIG 7

WITNESSES

J. L. Fuller,
J. Donsbach.

INVENTOR

Wendell Hess Jr.
By Brosner & Curtis
attys.

UNITED STATES PATENT OFFICE.

WENDELL HESS, JR., OF TROY, NEW YORK.

TALKING-MACHINE HORN.

981,648.

Specification of Letters Patent.

Patented Jan. 17, 1911.

Application filed July 9, 1906. Serial No. 325,297.

To all whom it may concern:

Be it known that I, WENDELL HESS, Jr., a citizen of the United States, residing at Troy, county of Rensselaer, and State of New York, have invented certain new and useful Improvements in Talking-Machine Horns, of which the following is a specification.

The invention relates to such improvements and consists of the novel construction and combination of parts hereinafter described and subsequently claimed.

Reference may be had to the accompanying drawings, and the reference characters marked thereon, which form a part of this specification. Similar characters refer to similar parts in the several figures therein.

Figures 1, 2, 3 and 4, are sectional views illustrating successive steps in the securing together of plies of cloth in the manufacture of my improved phonograph-horn. Fig. 5 is a central, vertical, longitudinal section showing the cloth-body stretched upon a horn-shaped form. Fig. 6 is a plan view of one of the segmental blanks of cloth used in the manufacture of the horn. Fig. 7 is a view in side elevation of the horn with a portion of the edge broken away and shown in central, longitudinal section.

The principal object of my invention is to produce a sound-strengthening device adapted for use in, or in connection with, musical and sound-reproducing instruments.

Other objects of the invention will appear in connection with the following description.

I have shown, and will describe, my invention in its preferred application to the horn of a sound-reproducing instrument; but it is also adapted for use in any case where it is desired to reflect and strengthen sound vibrations.

The invention consists in a body of the desired shape made up of a plurality of plies of cloth stiffened and bound together by a suitable cement or size.

Referring to the drawings wherein the invention is shown in preferred form, 1, represents a phonograph-horn embodying my invention and made in accordance with my improved method. In making such a horn I preferably cut from a web, or webs, of cloth a number of plies, 2, of substantially the form shown in Fig. 6 of the drawings, each blank being approximately a quarter segment of a phonograph horn of the desired size. I then superpose one upon another a

number of said blanks, double that of the number of plies of which the horn is to be made, and secure all of said plies together along one edge, from the tapered to the flared end of the horn, by a line of stitching, 3, after which I apply to the edges so stitched together a binding strip, 4, one edge of which is first secured by a line of stitching, 5, as shown in Fig. 2, after which the other edge is secured by a line of stitching, 6, as shown in Fig. 3. I have shown in Figs. 1, 2 and 3, eight plies or blanks thus secured together along one edge, it being desired to produce a horn four plies in thickness. After the plies have been thus secured together along one edge, they are opened out between the fourth and fifth plies and four additional plies are applied to each of the four plies so separated, and the edges of each eight plies thus formed are secured together in the manner above described. The unsecured edges of the additional eight plies are then secured together in the same manner completing the inclosure adapted to be made into a horn. The body thus formed is then saturated with starch and is drawn or stretched over a form of the proper size and desired shape and permitted to shrink and dry thereupon. A preferred manner of saturating the fabric with starch is to immerse the fabric in a hot liquid solution of cooked starch until the starch has penetrated to all parts of the fabric and filled the interstices thereof. When the starch has become dry and hard, the plies will be firmly bound together into a practically solid body which will be hard and stiff and adapted to retain the shape imparted by the form. The body thus formed comprises substantially a homogeneous body of hardened starch supported by the plies of fabric embedded therein. After the horn has been thus formed, its end edges are trimmed and covered with a binding strip, 8, which may be an ordinary piece of tape glued or cemented thereupon. At each of the four longitudinal seams a stiffening rib is formed by the stitched together edges of the plies and the binding strip applied thereto, so that great strength is given to the structure. Any desired cement or size may be employed; and the quality or timbre of the sound reflected or transmitted by the horn can be varied by varying the kind and consistency of the cement, as well as by varying the number of plies of cloth of which the horn is made.

I have shown and described a preferred construction of horn, but I do not wish to be limited thereto, as the manner of constructing the device can be varied in accordance with the use to which the device is to be put and the wishes of the maker or user.

The body of the device may be made up of plies of any desired kind of cloth, knitted or woven, but I prefer to use ordinary woven cotton cloth.

The shape and size of the device can be varied in accordance with the conditions to which it is to be subjected in use.

What I claim as new and desire to secure by Letters Patent is—

1. A sound-strengthening device comprising a substantially homogeneous body of hardened cooked starch, having embedded therein, and saturated therewith, a plurality of plies of cloth.

2. A sound-strengthening horn formed of a plurality of segments each comprising a plurality of plies of cloth sewed together along their neighboring edges, and stiffened and bound together by cement.

3. A sound-strengthening horn formed of a plurality of segments each comprising a plurality of plies of cloth having the neighboring edges of adjacent segments secured together by a stitched seam, and said edges covered by a binding strip, the several plies being stiffened and bound together by cement.

In testimony whereof, I have hereunto set my hand this 5th day of July, 1906.

WENDELL HESS, JR.

Witnesses:

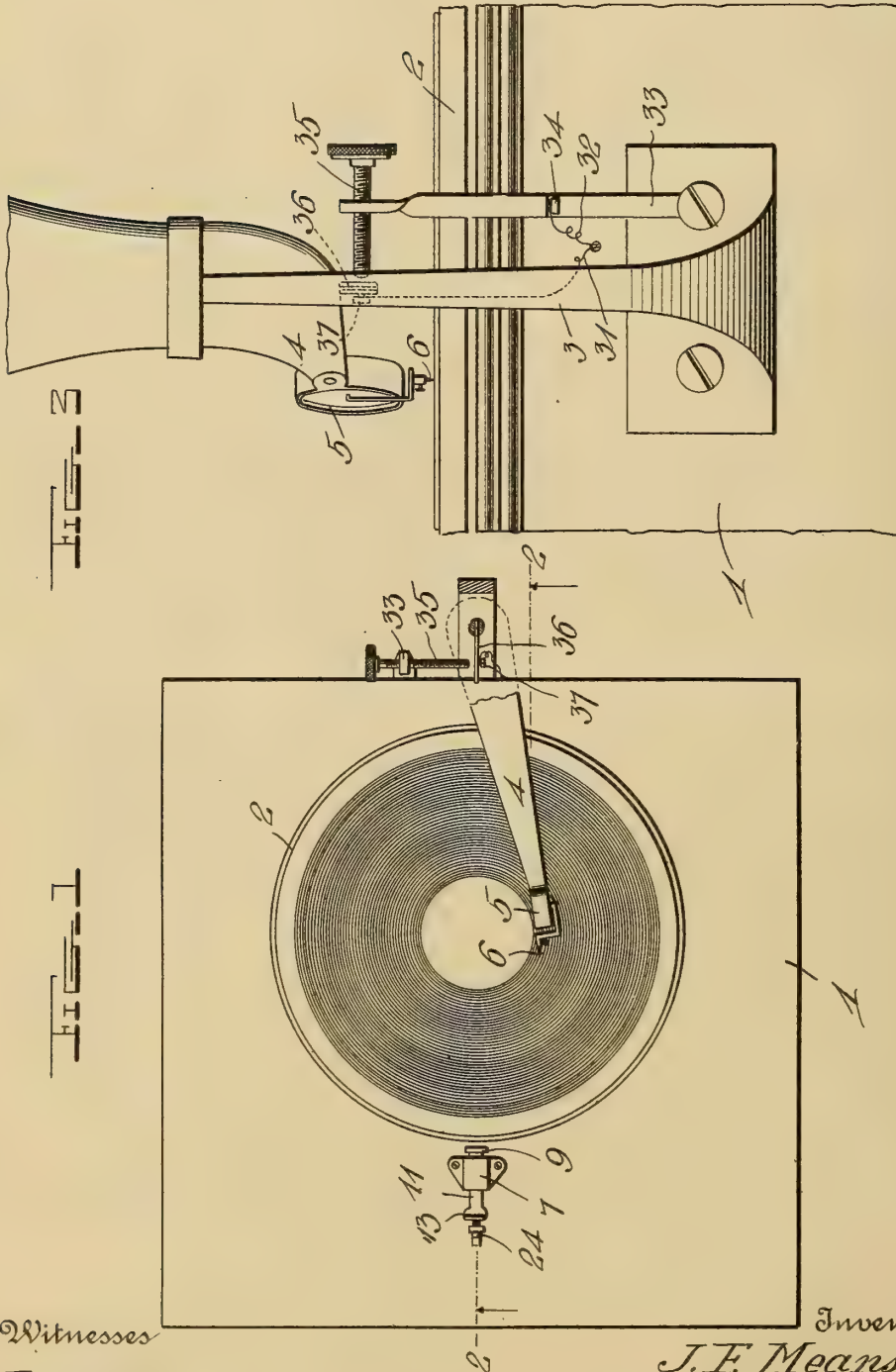
GEO. A. MOSHER,
E. M. O'REILLY.

J. F. MEANS.
ELECTRIC BRAKE FOR GRAPHOPHONES.
APPLICATION FILED APR. 18, 1910.

981,935.

Patented Jan. 17, 1911.

2 SHEETS—SHEET 1.



Witnesses
C. C. C. C.
C. R. Hardy

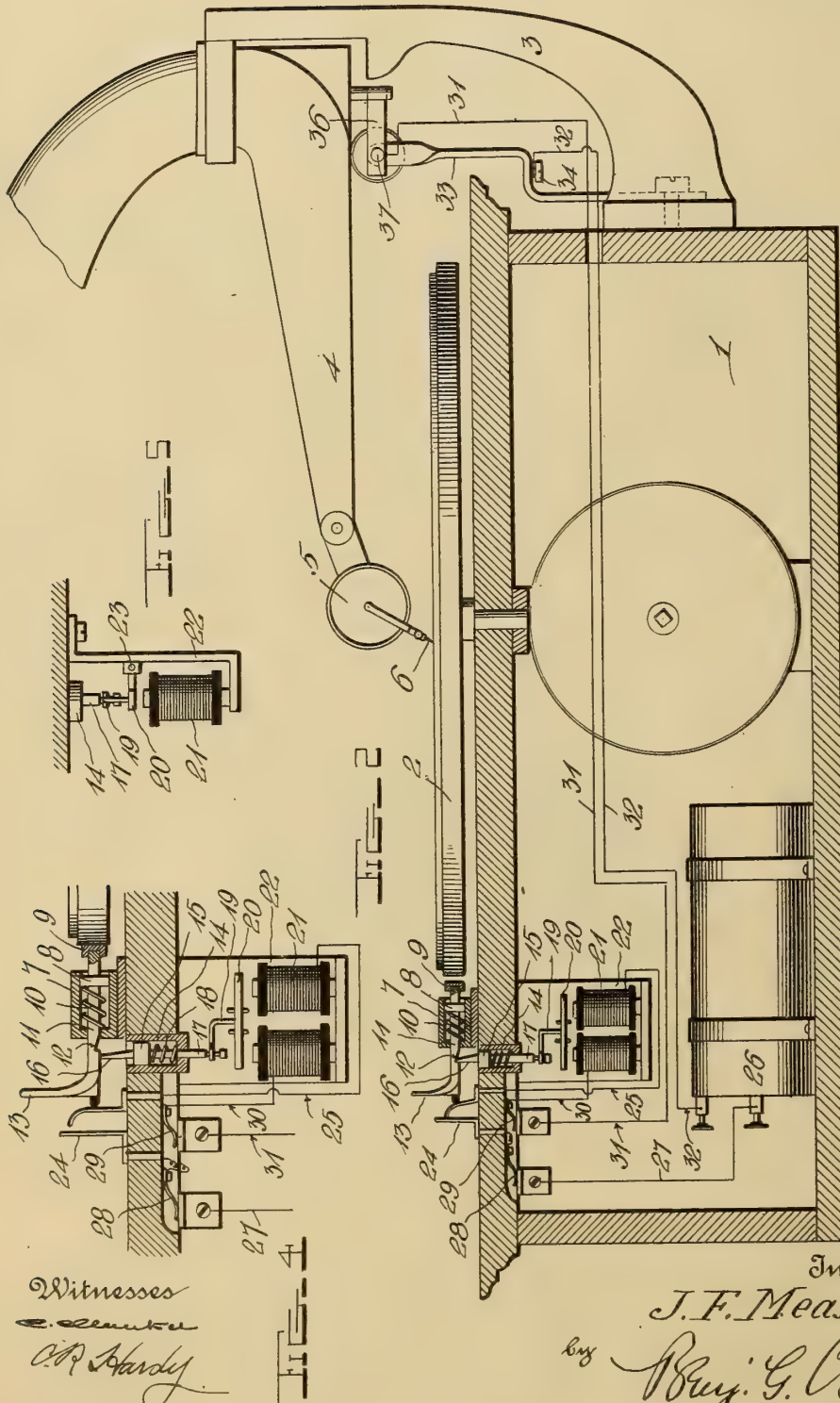
Inventor.
J. F. Means
by Ben. G. Cowl
Attorney

J. F. MEANS.
ELECTRIC BRAKE FOR GRAPHOPHONES.
APPLICATION FILED APR. 18, 1910.

981,935.

Patented Jan. 17, 1911.

2 SHEETS—SHEET 2.



Witnesses
C. E. Clement
C. P. Hardy

Inventor
J. F. Means
by
Ray. G. Cowl
Attorney

UNITED STATES PATENT OFFICE.

JOHN F. MEANS, OF OIL CITY, PENNSYLVANIA.

ELECTRIC BRAKE FOR GRAPHOPHONES.

981,935.

Specification of Letters Patent.

Patented Jan. 17, 1911.

Application filed April 18, 1910. Serial No. 556,000.

To all whom it may concern:

Be it known that I, JOHN F. MEANS, a citizen of the United States, residing at Oil City, in the county of Venango and State of Pennsylvania, have invented new and useful Improvements in Electric Brakes for Graphophones, of which the following is a specification.

This invention relates to improvements in electric brakes for graphophones.

The prime object of the invention is to provide an improved construction of electric brake mechanism for graphophones whereby the machine will be automatically stopped.

Another object is to provide means whereby the circuit closing mechanism of the electric brake releasing mechanism may be adjusted to operate the brake when the needle has reached any desired place on the record.

With these and other objects in view, the invention consists of certain novel features of construction, combination and arrangement of parts as will be more fully described and particularly pointed out in the appended claim.

In the accompanying drawings: Figure 1 is a plan view of a disk graphophone with parts broken away and showing the application of the invention; Fig. 2 is a vertical section of the same on the line 2—2 of Fig. 1; Fig. 3 is a rear view; Fig. 4 is a vertical section of a portion of the machine showing the brake releasing mechanism on an enlarged scale; and, Fig. 5 is a similar view showing an end elevation of the electromagnets for operating the brake releasing devices.

Referring more particularly to the drawings 1 denotes the cabinet in which are arranged the motor and operating mechanism. Above the cabinet and revolvably mounted therein is a turn table 2 on which the record disks are arranged and operated. On one side of the cabinet is secured the horn supporting bracket 3 in the upper end of which is pivotally mounted the sound transmitting horn 4 which carries the reproducer 5 having the record engaging needle 6. These parts may be of the usual or any desired construction and do not form a part of the present invention.

My improved brake mechanism comprises

a brake cylinder 7 which is mounted in any suitable position on the cabinet adjacent to the edge of the turn table 2. In the cylinder 7 is slidably mounted a brake piston or plunger 8 carrying on its outer end a brake shoe 9 which is adapted to be forced into engagement with the edge of the turn table for the purpose of stopping the same. The plunger or piston 8 is projected and held in an operative position by means of a coiled spring 10 arranged around the rod or stem 11 of the piston within the casing 7 as shown. The outer end of the rod or stem 11 extends through and projects beyond the outer end of the cylinder 7 and has formed therein a stop notch 12 with which when the plunger is in a retracted or inoperative position is adapted to be engaged a suitable catch whereby said plunger is held in an inoperative position. The outer end of the rod or stem 11 is preferably turned upwardly to form a handle 13 whereby the plunger may be retracted.

The catch for holding the plunger in a retracted position comprises a cylinder 14 which may be arranged in any suitable position and is here shown as being set into the top of the cabinet. Slidably mounted in the cylinder 14 is a piston or plunger 15 having on its outer end a stop finger 16 which is adapted to engage the notch 12 in the brake plunger rod when the latter is in a retracted position. The plunger or piston 15 is provided with a stem or rod 17 which projects through the inner end of the casing. Around the stem or rod 17 within the casing 14 is arranged a coiled projecting spring 18 the pressure of which is exerted to normally force the plunger outwardly in the cylinder thus moving the stop finger 16 to a position for engaging the notch 12 in the brake plunger rod.

The outer end of the rod or stem 17 of the catch plunger is operatively connected by a right angular arm 19 with the armature 20 of an electromagnet 21 which may be arranged in any suitable position and which is here shown as being arranged in the cabinet 1 and supported by a bracket or hanger 22 secured to the inner side of the top of the cabinet. The armature 20 is preferably hingedly connected to the bracket 22 as shown at 23.

On the cabinet adjacent to the outer end

of the brake plunger rod 11 is a circuit breaker 24 one member of which is in electrical connection with one pole of the magnet 21 by a conducting wire 25 while the other member of said circuit breaker is in electrical connection with a suitable battery 26 by a current conducting wire 27. The battery 26 may be arranged in any suitable manner but is here shown as being arranged in the cabinet 1. In the current conducting wire 27 between the circuit breaker and the battery is preferably arranged a spring contact terminal 28. The opposite pole of the magnet 21 is connected to a spring contact terminal 29 by a current conducting wire 30. With the terminal 29 is connected a current conducting wire 31 which leads to a contact switch hereinafter described. The other terminal of said switch is connected to the battery 26 by a current conducting wire 32. When the brake plunger rod 11 is retracted to an inoperative position and is engaged by the stop finger 16 the outer end of said plunger rod will engage the circuit breaker 24 and close the same.

The circuit closing switch for the electro-magnet as here shown preferably consists of a bracket 33 secured to one side of the cabinet 1. On the bracket 33 is arranged a binding screw 34 with which is connected the terminal of the current conducting wire 32 from the battery. In the upper end of the bracket 33 is adjustably mounted a contact screw 35 which forms one terminal of the switch. The other terminal of the switch is in the form of an arm or bar 36 which is secured to the horn 4 and is moved thereby as the latter swings back and forth over the record with the movement of the needle. In the bar 36 is arranged a binding screw 37 with which is connected the terminal of the current conducting wire 31 of the electro-magnet.

In using the device the horn is first swung over the record until the needle is in position to engage the end of the thread or groove formed in the record after which when the parts are in this position the contact screw 35 is screwed through the bracket 33 until the end thereof comes into engagement with the switch bar 36 carried by the horn. After the screw 35 has thus been adjusted the arm is swung back until the needle is in position to engage the beginning of the thread or groove of the record. The brake plunger 8 is retracted to disengage the brake shoe 9 from the turn table whereby the latter is permitted to revolve. The brake plunger is held in a retracted position by the stop finger 16 as hereinbefore described and when said plunger is retracted the outer end of the plunger rod or bar 11 will close the circuit breaker 24 and hold the same in closed position until the plunger rod is released by the movement of the stop finger. With the

parts in this position the turn table will continue to revolve until the needle has reached the end of the groove or thread on the record or any other point where it is desired to stop the machine at which time the switch bar 36 will be brought into engagement with the contact screw 35 thereby completing the circuit to the electro-magnet thus energizing the same and causing said magnet to attract the armature 20. The movement of the armature will pull the plunger 18 downwardly thereby disengaging the stop finger 16 from the notch 12 in the brake plunger rod thus releasing said rod and permitting the spring 10 to force the brake shoe into engagement with the turn table thereby stopping the latter. When the plunger is thus projected the outer end of the plunger rod 11 will be disengaged from the circuit breaker 24 allowing the members thereof to spring apart and thus again breaking the circuit to the magnet.

By means of my improved brake and switch mechanism it will be readily seen that the machine may be stopped at any desired place on the record. While the brake and its operating mechanism has been herein shown and described as applied to a disk record machine it will be understood that this application is simply shown for illustrative purposes and I do not wish to be understood as confining myself to the use of the switch in this style of machine as the same may be readily applied to a cylinder machine and the brake mechanism arranged thereon in position to engage the record mandrel or other moving part of the machine whereby the machine will be stopped.

From the foregoing description taken in connection with the accompanying drawings, the construction and operation of the invention will be readily understood without requiring a more extended explanation.

Various changes in the form, proportion and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention as defined in the appended claim.

Having thus described my invention what I claim is:

A structure of the character described comprising a cabinet with a turn table thereon, a brake cylinder secured to the cabinet, a spring actuated stem mounted in the cylinder having a plunger thereon, a brake shoe on said plunger adapted to contact with said table, said stem also having a notch therein, a device for holding the above named plunger in retracted position consisting of a cylinder provided with a spring actuated stem projecting through the inner end of the cylinder and having a plunger thereon provided with an upwardly projecting finger adapted to engage said notch, said project-

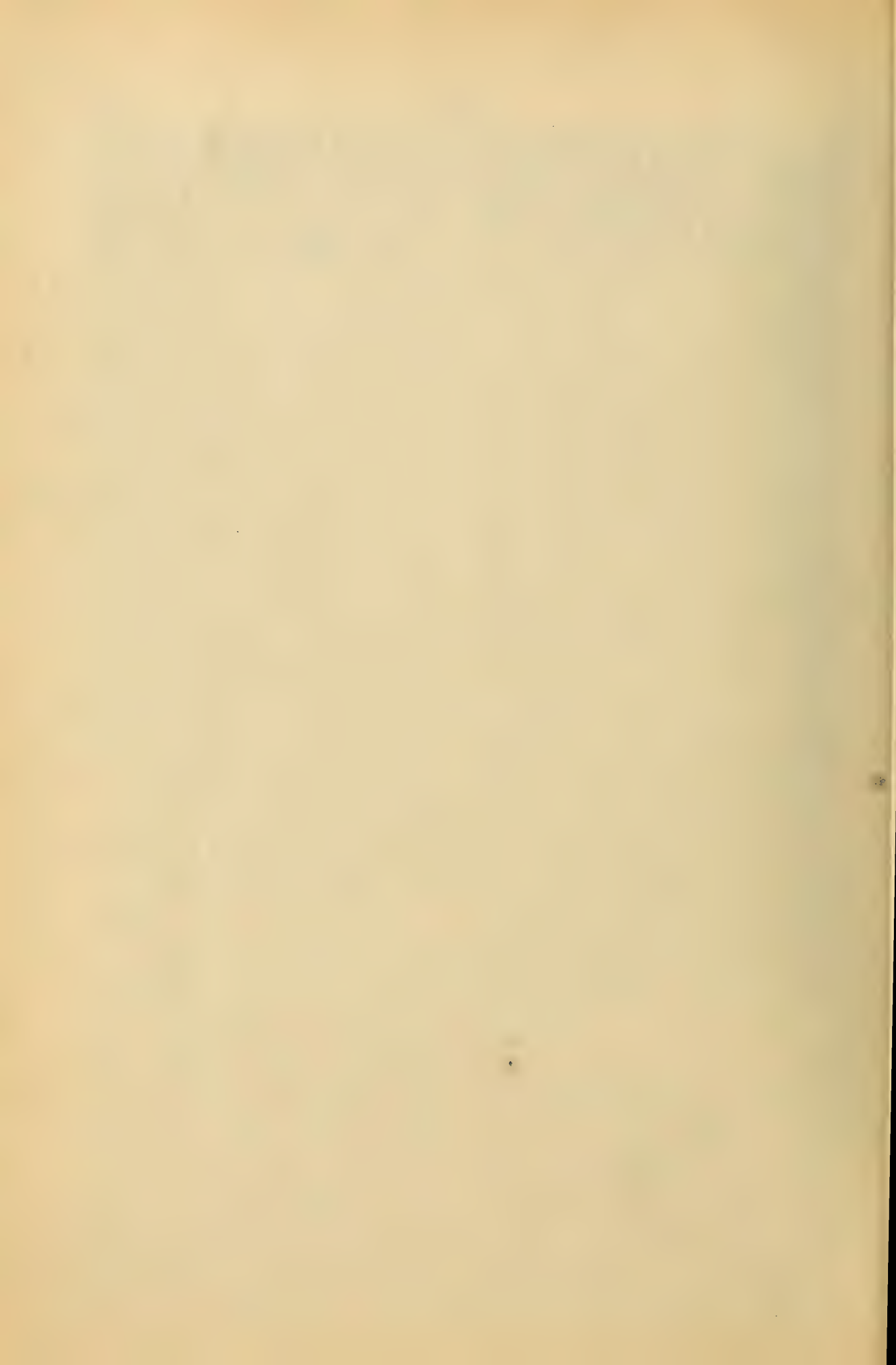
ing end of the stem having a right angular
arm thereon provided with an armature,
magnets for actuating the same, a sound box,
a swinging arm carrying the same, contacts,
5 one of which is carried by said arm, and a
source of energy for energizing said mag-
nets when said contacts are closed.

In testimony whereof I have signed my
name to this specification in the presence of
two subscribing witnesses.

JOHN F. MEANS.

Witnesses:

A. L. CONFER,
E. W. CHASE.



W. W. YOUNG:
METHOD OF MAKING ACOUSTIC DIAPHRAGMS.
APPLICATION FILED JAN. 23, 1909.

982,027.

Patented Jan. 17, 1911.

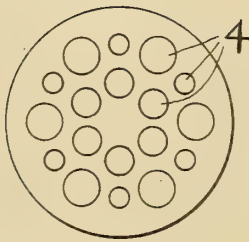


FIG. 1.

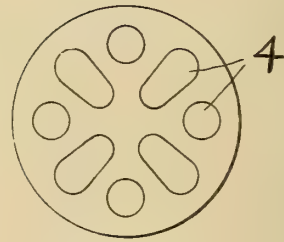


FIG. 2.

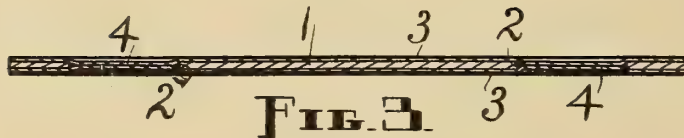


FIG. 3.



FIG. 4.



FIG. 5.

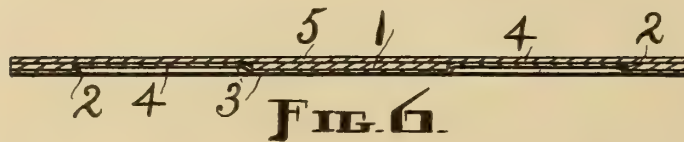


FIG. 6.



FIG. 7.

WITNESSES:

A. C. Fairbanks.
J. M. Sterne

INVENTOR.

William W. Young,
BY
Webster & Co.,
ATTORNEYS.

UNITED STATES PATENT OFFICE.

WILLIAM W. YOUNG, OF SPRINGFIELD, MASSACHUSETTS.

METHOD OF MAKING ACOUSTIC DIAPHRAGMS.

982,027.

Specification of Letters Patent.

Patented Jan. 17, 1911.

Application filed January 23, 1909. Serial No. 473,819.

To all whom it may concern:

Be it known that I, WILLIAM W. YOUNG, a citizen of the United States of America, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented a new and useful Method of Making Acoustic Diaphragms, of which the following is a specification.

My invention relates to improvements in methods of manufacturing acoustic diaphragms for talking-machines, telephones, and the like, and consists in the several steps hereinafter set forth.

The object of my invention is to produce an acoustic diaphragm, of the class indicated above, which possesses in a marked degree not only the essential but the desirable characteristics and qualities of a device of this kind, such as durability and stability, resiliency and resonance, capability of giving out clear, loud and distinct tones of great volume and depth, and of evenly distributing the sound waves and quickly, completely and perfectly recovering its stable equilibrium, and immunity from blasts and scratching sounds and other alien and discordant noises.

In the accompanying drawings, which form part of this application, and in which like characters of reference indicate like parts throughout the several views, Figures 1 and 2 are side views of two diaphragms made in accordance with the new method, showing different formations and arrangements of the lesser or minor diaphragms, and Figs. 3, 4, 5, 6 and 7 are sectional views of five diaphragms, on an enlarged or exaggerated scale, illustrating different combinations or arrangements of the diaphragm-forming elements, incident to the putting into effect of said method.

Before explaining how the new diaphragm is produced, I wish to state that said diaphragm may be made individually, that is, by itself, or a sheet or strip may be prepared and the diaphragm cut from this, whichever way is most practical with any given material or materials. For the sake of brevity I will apply the following description to a single diaphragm, but as just stated this diaphragm might be a part of a strip or sheet from which it is to be cut at some particular stage or at the end of the manufacturing process.

First I take a disk of some suitable material and which has been perforated in some

suitable manner and apply with a brush or otherwise a compound, solution, mixture or emulsion which possesses the necessary qualifications; next I cover one or both sides of said disk with a thin diaphragmal integument or integuments and apply more of the compound, solution, mixture or emulsion as before; then I partially dry the disk thus prepared, by exposing it to air or subjecting it to heat; then I subject said disk to pressure between steel plates or the like, and finally I bake the disk. The only important changes in this method, that is to say, important as affecting the structure of the resulting product which is the finished diaphragm, consist—first, in using two disks, of what may be termed the base material of the diaphragm, instead of one, by placing the second disk over an integument on the first disk, the perforations in both disks being in correspondence and separated by said integument; and, second, in employing two different kinds of integuments for the lesser diaphragms, the two integuments generally comprising different materials and being arranged either both on one side of a disk of base material, or one on each side of such disk. In the first of these exceptions there is, as a rule, no outside integument or integuments on the completed diaphragm.

A diaphragm proper such as is shown in Fig. 3, wherein 1 represents a disk of base material having perforations 2 therein, 3—3 represent integuments on both sides of said disk, and 4 represents a lesser diaphragm across each of such perforations, is the resulting product of the method as first outlined. Slightly modified resulting products of the method as explained appear in the next three views, in which Fig. 4 shows a diaphragm proper which comprises two perforated disks 1 with a single integument 3 between to form the lesser diaphragm 4; Fig. 5 shows a diaphragm proper which comprises a perforated disk 1 and two integuments 3 and 3' of different materials on one side of said disk to form the lesser diaphragm 4; and Fig. 6 shows a diaphragm proper which comprises a perforated disk 1 and two integuments 3 and 3' of different materials on opposite sides of said disk. That in so far as the merit of my invention are concerned one diaphragm is as good as any other and that all are, to all intents and purposes, and from a patentable standpoint, substantially alike and produced in substance

tially the same way are self-evident facts. In the Fig. 3 diaphragm the integuments 3 at the time they are applied to the disk 1 should be pressed into the perforations 2 and into contact with each other, so that in the finished diaphragm the portions of said integuments that are in said perforations and which form the lesser diaphragms 4 will be firmly stuck or cemented together and will therefore be strong and durable. And in the Fig. 6 diaphragm the integument 3 is pressed into the perforations 2, at the time of manufacture, and caused to adhere to those portions of the integument 5 which cover said perforations, as shown.

Various materials for the disk 1 may be employed, among which mention is made of mica, wire-gauze, sheet-metals such as aluminum, steel, etc., and fibrous materials such as more or less heavy paper and cardboard or bristol-board, blotting-paper, and the like. The employment of sheet-iron and some other metals renders the diaphragm fit for telephone purposes.

The perforations 2 should be clean-cut holes in the disk 1, and they may be of various shapes and sizes, arranged in any desired form regularly or irregularly, and more or less numerous. In the first two views there are shown lesser diaphragms 4 which are outlined by perforations that differ considerably, and from this it is clear that there is almost no limit to the different designs that may be given such perforations both as to outline and arrangement.

The material or combination of materials used for coating the disk or disks 1 and the integument or integuments 3 or 3 and 5 must be of such a nature that the same will adhere firmly to the base material of the diaphragm, that is, the disk or disks, and cause the integument or integuments also to adhere firmly to said base material or to each other, and where integuments are employed on opposite sides of the disk to cause them to stick together in or through the perforations 2; furthermore, the nature of the coating must be such that it will so unite with the other elements and harden during the process of manufacturing the diaphragm as to produce the stable and otherwise excellent device sought for. I have found that a coating which consists of silicate of soda, oxid of zinc, plaster of paris and barytes, gives most excellent results, the silicate of soda comprising about 95 per cent. of the emulsion thus produced, and the other ingredients comprising the other 5 per cent. in proportions of about one-third each. This emulsion when properly applied to the other elements, pressed and baked, cements such elements together and unites with them, even when the base material or one of the integuments or both is or are metal, to form a diaphragm which possesses the qualities

hereinbefore enumerated. I do not, however, intend to confine myself to any particular coating material or materials since the range of materials useful for this purpose is large. In this connection baking japans and varnishes may be mentioned as suitable materials for the coatings.

Tissue paper, silk, linen, and various other thin fabrics are exceedingly well fitted for the integument or integuments 3 out of which may be formed or by means of which may be produced the lesser diaphragms 4. These fabrics take the coating nicely, adhere firmly to the base material, and furnish lesser diaphragms of the right character. For the integument 5, which also may enter into the formation of the lesser diaphragms 4, as stated, I prefer to employ very thin metal such as metal foil, because this takes the coating well, and the results obtained therefrom acoustically are of the best, even when the foil is used alone without the fabric, as it may be.

The partial drying by either exposure to air which is substantially free from moisture or subjecting to direct heat is a step in the method which will be readily understood and needs no further explanation, and the same is true of the pressing or compressing.

The last step, that of baking, appears to be necessary in order to fix the emulsion or its equivalent, after the latter has been applied to the diaphragmal members and pressed into or against them as the case may be, and thus firmly, completely and permanently to unite the several materials into an integrate structure. With some metal disks and integuments and the aforesaid emulsion, while the latter does not, of course, enter the metal as it does fiber and fabric to a greater or less extent, nevertheless said emulsion apparently forms a chemical combination with the metal when baked, and probably does so.

The perforations 2 are made in the disk 1 when said disk consists of wire-gauze just the same as when it consists of material which is imperforate originally.

It is not imperative that two integuments, when that number is used, shall meet to be united in or through the perforations 2, although the structure is stronger when they are so united and it is thought that the desirable acoustic properties of the diaphragm as a whole are enhanced thereby.

Each of the diaphragms proper or major diaphragms shown in the drawings includes a plurality of lesser or minor diaphragms, 4, but there might be only one minor diaphragm in each case and that one may be of any suitable size and shape.

In addition to the variations already noted herein others may be made in my invention provided the scope of the claims be not

exceeded. As examples of such additional variations, I desire to call attention to the following, from which it is obvious that the different combinations or arrangements of disks and integuments that may be resorted to are quite numerous. The metal-foil integument 5 may be substituted for the fabric integuments 3 in the Fig. 4 arrangement, or said integument, may be introduced into the Fig. 4 arrangement while still retaining said integument 3. In this last example, however, instead of combining only the two integuments 3 and 5, as in Fig. 5, with the second disk 1 added, I may introduce a second integument 3 so that the integument 5 shall be between the two integuments 3 and these three between the two perforated disks. Fig. 7 illustrates the last-mentioned arrangement or combination. Foil integuments 5 may be used in the Fig.

3 arrangement, but they need not necessarily meet in or through the disk perforations.

What I claim as my invention, and desire to secure by Letters Patent, is—

The method of making acoustic diaphragms, of the class described, consisting in applying a suitable moist coating to a perforated base material member and uniting a diaphragmal integument with such base material member, such integument being thinner than the base material member and extending across the perforation therein to form a lesser diaphragm, in applying such moist coating to the united parts externally, in partially drying, in pressing, and in baking.

WILLIAM W. YOUNG.

Witnesses:

F. A. CUTTER,

A. C. FAIRBANKS.

J. A. JOHNSON.
STOP FOR GRAMOPHONES.
APPLICATION FILED APR. 21, 1910.

982,138.

Patented Jan. 17, 1911.

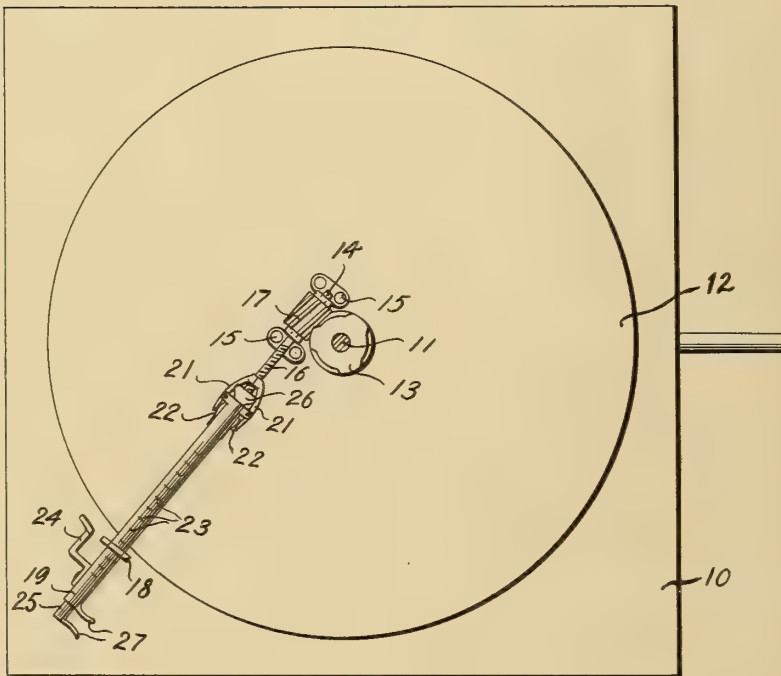


Fig. 1

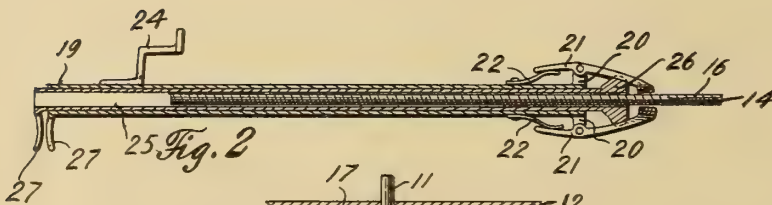


Fig. 2

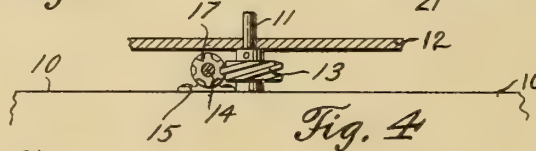


Fig. 4



Fig. 3

Witnesses

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STOP FOR GRAMOPHONES.

982,138.

Specification of Letters Patent.

Patented Jan. 17, 1911.

Application filed April 21, 1910. Serial No. 556,843.

To all whom it may concern:

Be it known that I, JOHN A. JOHNSON, a citizen of the United States, residing at Sauk Center, in the county of Stearns and State of Minnesota, have invented certain new and useful Improvements in Stops for Gramophones, of which the following is a specification.

This invention relates to gramophones and particularly to brakes for the same which will stop the rotation of the turn table when the extremity of the record has been reached.

It also contemplates the construction of a device of this type which may be retained from operation while the same is being set.

A further object is the provision of a means whereby the records may be gaged and the brake set to conform with the size of the record.

With the above and other objects in view this invention consists in the construction, combination, and arrangement of parts all as hereinafter more fully described, claimed, and illustrated in the accompanying drawings, wherein

Figure 1 is a top plan view of a gramophone embodying the present invention, illustrating the box and turn table diagrammatically; Fig. 2 is a central longitudinal section of the brake operating mechanism; Fig. 3 is an interior elevation of one of the operating shaft engaging levers; Fig. 4 is an end elevation of the brake operating shaft illustrating the cooperation thereof with the gramophone shaft.

The present invention resides in the provision of a worm gear carried on the central vertical shaft of a gramophone directly beneath the turn-table, said worm gear meshing with a worm keyed to a shaft, and said shaft extending outwardly toward the periphery of the turn-table and is threaded substantially its entire length. A tubular member is mounted under the turn table and carries at its inner extremity a pair of oppositely disposed spring pressed levers which are threaded to engage the threads of said shaft. Thus as said shaft turns said tubular member is drawn inwardly and due to the fact that the same carries a brake which will operate against the edge of the turn table, consequently the rotation of said turn table will cease.

An inner tubular member provided with an enlargement at its inner extremity is reciprocatingly mounted within the outer

tubular member and is so constructed that an enlargement at the terminal thereof will release the levers aforesaid from engagement with the threads on the shaft permitting the brake carried by the outer tubular member to be withdrawn from the periphery of the turn table.

Reference being had more particularly to the drawings 10 indicates the top of a gramophone box provided with a central vertical shaft 11 on which is rigidly mounted the turn table 12. Keyed to the shaft 11 directly below the turn table is a worm gear 13, said gear being adapted to rotate with the shaft and at the same rate of speed. A shaft 14 is journaled in the bearings 15 adjacent to the worm gear 13 and is provided with the threads 16 extending substantially from one of said bearings to the terminal of the shaft. In order that this shaft may be constantly rotated by the worm gear 13, a worm 17 is keyed to the shaft 14 between the brackets 15 and is constantly in mesh with the gear 13.

A guide or bracket 18 is secured to the top 10 of the gramophone box adjacent to the periphery of the turn table 12, in which is slidably mounted the outer tubular member 19 which incases the threaded extremity of the shaft 14. The inner terminal of this tubular member is provided with the oppositely disposed ears 20 to which are pivoted the levers 21, the rear terminals of said levers having the springs 22 bearing thereagainst to insure the constant engagement of the thread 16 by the forwarded threaded terminals of the levers 21, said springs being carried by the tubular member. The outer side of the member 19 is provided with a gage 23 which in combination with the bracket provides a means whereby the brake may be adjusted to various sizes of records.

A brake member 24 is carried by the tubular member 19 in such a manner that the same is adapted to bear against the periphery of the turn table and the tubular member is drawn in by the contact of the threaded lever 21 with the constantly rotating shaft 14.

An inner tubular member 25 is slidably mounted in the member 19 and is provided at its inner terminal with the flotted enlargement 26, the lot of which are adapted to engage the levers 21 and cause the same to disengage the shaft 14 when the inner

member 25 is forced inwardly, thus permitting the brake to be withdrawn from the edge of the turn table.

The outer terminals of the tubes 19 and 25 are provided with the finger pieces 27, which facilitate the operation of the device. From the foregoing it will readily be seen that when the threaded levers 26 are brought into contact with the threads 16 of the shaft 14, which is constantly in rotation, the tubular member 19 will be gradually drawn toward the center of the phonograph, as a result of which the brake 24 will be brought into operative engagement with the periphery of the turn table 12, thereby stopping the rotation thereof. When it is desired to release the brake and withdraw the tubular member 19 in order that the next record may be started the inner tubular member 25 is forced inwardly, the slotted enlargement 26 causing the levers 21 to disengage the shaft, thereby permitting the tubular member 19 to be withdrawn.

Having thus fully described my invention, what I claim as new and desire to secure by United States Letters Patent is:

1. An automatic brake for talking machines, comprising in combination with a turn table, of a threaded shaft adapted to constantly rotate with said turn table, and means operative by the threads on said shaft whereby a brake may be applied to said turn table.

2. An automatic brake for gramophones, comprising in combination with a turn table, of a rotatable threaded shaft adapted to constantly rotate with said turn table, means operated by said shaft for applying a brake to the periphery of said turn table, and means whereby said last named means may be adjusted.

3. An automatic brake for gramophones comprising in combination with a turn table, of a rotatable threaded shaft adapted to constantly rotate with said turn table, means operated by said shaft for applying a brake to the periphery of said turn table, and means whereby the brake may be released.

4. An automatic brake for gramophones comprising in combination with a turn table, of a threaded shaft adapted to rotate therewith, a tubular member mounted under said turn table and adapted to incase said shaft, means whereby said tubular member may be drawn inwardly by said shaft, and a brake carried by said tubular member.

5. An automatic brake for gramophones comprising in combination with a turn table, of a threaded shaft adapted to rotate

therewith, a tubular member mounted under said turn table and adapted to incase said shaft, means whereby said tubular member may be drawn inwardly by said shaft, and means whereby the brake may be withdrawn from the turn table.

6. An automatic brake for gramophones, comprising in combination with a turn table operating on the central shaft of a gramophone, of a threaded shaft disposed below said turn table and driven directly from said central vertical shaft, a tubular member reciprocatingly mounted on said shaft, means carried by said tubular member whereby the same may traverse on said shaft, and a brake carried by said tubular member adapted to operate against the periphery of the turn table.

7. The combination with a gramophone having a central vertical shaft and a turn table carried thereby, of a threaded shaft mounted on said gramophone beneath said turn table adapted to be operated directly from said central vertical shaft, a tubular member reciprocatingly mounted on said shaft, levers pivoted to the inner terminal of said tubular member adapted to engage the threads of said shaft, and means whereby said levers may be disengaged from said shaft.

8. The combination with a gramophone having a central vertical shaft and a turn table carried thereby, of a threaded shaft mounted on said gramophone beneath said turn table adapted to be operated directly from said central vertical shaft, a tubular member reciprocatingly mounted on said shaft, levers pivoted to the inner terminal of said tubular member adapted to engage the threads of said shaft, and a secondary tubular member reciprocatingly mounted in said first mentioned tubular member adapted to disengage said levers from said threaded shaft.

9. The combination with a gramophone, of a shaft adapted to coöperate with the turn table thereof, means adapted to be drawn inwardly by said shaft, a brake carried by said means adapted to coöperate with the periphery of said turn table, and spring actuated shaft engaging members carried by said brake carrying means.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN A. JOHNSON.

Witnesses:

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G. L. COOPER.

782, 187

W. W. YOUNG.
TALKING MACHINE DIAPHRAGM.
APPLICATION FILED MAY 4, 1909.

982,197.

Patented Jan. 17, 1911.

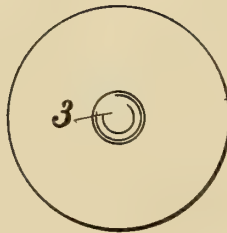


FIG. 1.

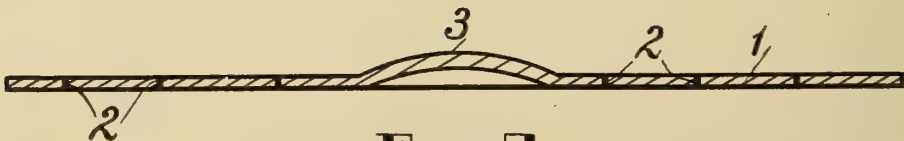


FIG. 2.

WITNESSES:

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INVENTOR.

William W. Young,
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UNITED STATES PATENT OFFICE.

WILLIAM W. YOUNG, OF SPRINGFIELD, MASSACHUSETTS.

TALKING-MACHINE DIAPHRAGM.

982,197.

Specification of Letters Patent.

Patented Jan. 17, 1911.

Original application filed December 1, 1908, Serial No. 465,474. Divided and this application filed May 4, 1909. Serial No. 493,840½.

To all whom it may concern:

Be it known that I, WILLIAM W. YOUNG, a citizen of the United States of America, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented a new and useful Talking-Machine Diaphragm, of which the following is a specification, the same being a divisional part of an application filed by me in the United States Patent Office on the first day of December, 1908, Serial No. 465,474.

My invention relates to improvements in reproducing diaphragms for talking-machines, and consists of a more or less porous material impregnated and permeated and surface treated with a filling material or materials of suitable character, hardened, and provided with a raised portion or integral protuberance, if desired, all as herein-after set forth. This diaphragm is exceedingly compact, hard, and tough, although thin, has smooth and even surfaces, and possesses a uniform thickness throughout excepting in the center where may be located the above-mentioned protuberance.

As is well-known, it is not possible to obtain the best results with reproducing diaphragms made of mica or sheet-metal, these especially the former being the kind commonly used in talking-machines, and besides the mica disks or diaphragms are extremely fragile and also expensive because of the waste incident to procuring disks of the proper size, and the primary object of my invention is to produce a substitute for mica, sheet-metal, and other varieties of diaphragms, which substitute possesses the necessary or desirable features outlined in the preceding paragraph, and in addition is resilient and resonant, is impervious to moisture and unaffected by climatic changes, and is capable of giving out clear, loud, and distinct tones of great depth and volume, of evenly distributing the sound waves and quickly, completely, and perfectly recovering its stable equilibrium, and of lessening to a great extent, if not eradicating altogether, all alien and discordant noises such as blasts and scratching sounds which are so frequent with the ordinary diaphragm. I attain this object by the means illustrated in the accompanying drawings, in which—

Figure 1 is a side view of a diaphragm which embodies my invention, and, Fig. 2, a

cross-section, on a large scale, of said diaphragm.

Similar figures refer to similar parts in the two views.

As a base material for my diaphragm, I find that a disk 1 of pure, hard-finished bristol-board which is quite thin answers better than anything else so far tried, especially if the same be perforated before it is filled, although almost any fibrous material or fabric, which is sufficiently porous to take up an adequate amount of filling material or materials, may be employed, such as leather, paper, or cloth, for example.

The perforations or holes in the disk 1 are represented at 2. These should be very fine, quite frequent, and extend through said disk from side to side. The perforations or holes 2 are for a two-fold purpose: first, to open numerous ways into the interior of the disk 1 so as to enable the filling to penetrate and permeate all parts of the disk structure and to become thoroughly and evenly distributed therein and therethrough, thus insuring that the diaphragm shall have practically no unfilled portions; and, second, to afford means for producing a diaphragm having a structure of different materials, or a structure that is broken up or divided into unlike parts as to texture.

The filling for the texture of the disk 1, whether or not said disk be perforated, preferably consists of one or more minerals held in solution in water by an alkali, together with an inert or neutral mineral that will mix with water and form with the other solution when combined therewith a suitable compound, mixture, or emulsion. Silicate of soda or silicate of potash and oxid of zinc are what I prefer to use, since the solution or compound resulting from the combination in the manner just stated of such ingredients readily and thoroughly unites with the disk 1 by entering the texture of the same and imparts to such disk the required properties. The disk 1 is filled with the aforesaid solution or compound, is coated with a dry powder such as oxid of zinc and with the filling solution or compound, and is compressed and dried. During the course of treatment to which the disk is subjected, a portion in the center thereof may be left in a less dense and compact condition, and consequently will be raised slightly so that

there is a protuberance 3 on one or both sides. This protuberance may be produced by having openings in the centers of the devices used in compressing the disk, and thus leaving the center of the disk practically free while the remainder of the disk is being compressed; or the protuberance may be produced by providing compression devices with male and female parts, but in this last event the raised portion of the disk would be of the same density as the other parts and would not be any thicker as it is in the other case.

The qualities of the diaphragm are not affected by the position of the protuberance 3, that is, whether it be on one side or the other of said diaphragm or whether it be upon both sides, therefore said position in this respect is immaterial. The protuberance 3 not only reinforces the diaphragm by assisting in keeping the diaphragm from getting out of shape or warping and at the same time by increasing the strength, durability, and endurance of the same, but enhances the sound reproducing qualities of the diaphragm in a most marked degree, and is especially efficacious in causing the sound waves to be evenly distributed and the diaphragm to make a quick and perfect recovery thereafter. This protuberance is not built up out of other materials or parts, but is an integral part of the diaphragm itself, therefore it cannot work loose and so produce a rattling sound or blast as it otherwise would be liable to do. As already noted, the protuberance may be omitted.

The compressing and heating to which the disk, filled and coated with the deposit from the mineral solution or compound, is sub-

jected, sets the ingredients and renders the finished diaphragm hard and fit for use.

The diaphragm made of the materials and in the manner hereinbefore described possesses certain characteristics that approach those of metal or glass, such as hardness, resiliency, resonance, and smoothness, and is in all respects suitable for the purpose for which it is intended.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. As a new article of manufacture, a diaphragm, for talking-machines, having a less dense center than the surrounding portions.

2. As a new article of manufacture, a diaphragm, for talking-machines, having a raised central portion which is less dense than the surrounding part.

3. As a new article of manufacture, a diaphragm, for talking-machines, consisting of a one-piece filled and hardened disk having a center of less compactness than the surrounding portions of said disk.

4. As a new article of manufacture, a diaphragm, for talking-machines, consisting of porous material and a non-volatile deposit from a silicate, alkali, and neutral mineral solution.

5. As a new article of manufacture, a diaphragm, for talking-machines, consisting of a one-piece disk of porous material which has perforations therein outside of the center and has been filled and coated with a non-volatile deposit from a silicate, alkali, and neutral mineral mixture.

WILLIAM W. YOUNG.

Witnesses:

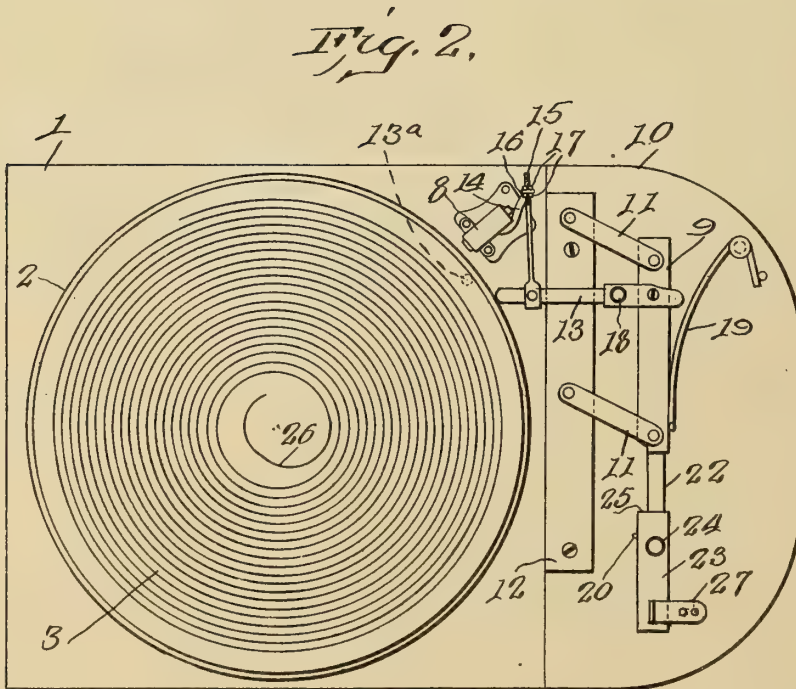
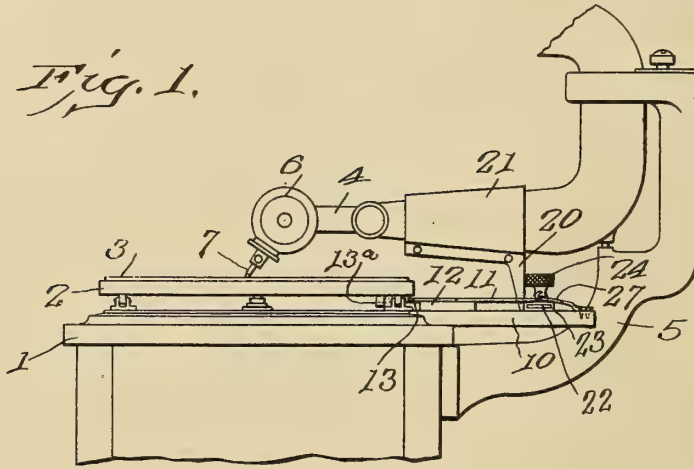
F. A. CUTTER,

A. C. FAIRBANKS.

D. C. & J. W. NELSON.
 AUTOMATIC STOP FOR TALKING MACHINES.
 APPLICATION FILED APR. 23, 1908.

982,293.

Patented Jan. 24, 1911.



Inventors
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James W. Nelson,

Witnesses

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 Attorney

UNITED STATES PATENT OFFICE.

DELPHOS C. NELSON AND JAMES W. NELSON, OF MARION, OHIO.

AUTOMATIC STOP FOR TALKING-MACHINES.

982,293.

Specification of Letters Patent.

Patented Jan. 24, 1911.

Application filed April 23, 1908. Serial No. 428,723.

To all whom it may concern:

Be it known that we, DELPHOS C. NELSON and JAMES W. NELSON, citizens of the United States, residing at Marion, in the county of Marion and State of Ohio, have invented certain new and useful Improvements in Automatic Stops for Talking-Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to automatic stops for talking machines, and the object of the invention is to provide means for automatically stopping the movement of a record support when the sound-reproducing device has reached the end of the record: and to provide adjustable means for controlling the actuating mechanism for the stop.

With these objects in view our invention consists in certain novel features of construction and in certain parts and combinations hereinafter to be described, and then more particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a side elevation of a talking machine equipped with our invention; and Fig. 2 is a top plan view of the same, with the sound-reproducing device and its support removed.

In these drawings we have illustrated the preferred form of our invention and have shown the same as applied to a well known form of machine embodying a disk record, but obviously, the device is capable of wide variations from the particular construction herein shown and can be adapted to different types of machines. We have here shown the talking machine as comprising a motor casing 1 having mounted thereon the usual turn-table 2 which supports the disk record 3. An arm 4 is pivotally supported at its outer end on a bracket 5 carried by the motor casing 1 and extends inwardly over the record 3 and carries at the inner end thereof a suitable sound-reproducing device 6 provided with the usual needle 7. A suitable stop, such as a brake 8, which is here shown as of ordinary construction, is provided for controlling the movement of the turn-table and the record disk, which is supported thereon.

As is well known in talking machines of this type, the needle 7 of the sound-reproducing device travels over the record from a point near the periphery thereof to the end of the record which lies near the center of the disk. When the disk continues to rotate after the pin has reached the end of the record groove, it defaces and damages the record, as well as causes an unpleasant sound. In order to overcome these objections, we have devised means for automatically actuating the stop or brake 8 to check the movement of the turn-table and the record carried thereby as soon as the sound-reproducing device reaches the end of the record and have provided means controlled by the movement of this sound-reproducing device over the record for controlling the automatic stop-actuating mechanism. In the present instance, we have shown the stop-actuating mechanism as comprising a movable member, such as a bar 9, which is preferably mounted upon a base 10 secured to and extending rearwardly from the edge of the motor casing 1. This bar 9 is operatively connected to the brake 8 and is adapted to be moved in such a direction as to operate that brake. In the preferred construction, the bar 9 is connected to the base 10 by means of suitable links 11 which are pivotally connected at one end to the bar 9 and at the other end to a plate 12, which is rigidly secured to the base 10 near the inner edge thereof. An arm 13 is pivotally connected at one end to the bar 9 and is connected near its other end to a stop controlling member or actuating lever 14, which is operatively connected to the stop or brake 8. The stop-controlling member may be of any suitable character and may be operatively connected to the stop either for the purpose of actuating the same or for controlling a spring actuated stop. The controlling member or lever is preferably connected to the arm 13, by means of a connecting rod 15 pivotally secured at one end to the arm 13 and having its other end screw threaded and extending through an apertured lug 16 on the stop-controlling lever 14, which is adjustably secured thereto by means of jam nuts 17 mounted on the

screw-threaded end of the rod 15 on opposite sides of the apertured lug 16. The arm 13 is preferably made adjustable by forming the same in two parts and slidably connecting said parts one to the other, the relative movement of the two parts being controlled by the thumb-nut 18.

The present form of connection between the bar 9 and the base causes said bar to move diagonally of the base 10 and in a direction away from the brake and toward the end of the record, which, in the present instance, is the center of the record disk, the bar being actuated by a spring 19 which is mounted upon the base 10 and engages the rear side of the bar 9, thus tending to force the same inwardly toward the record. When the bar 9 reaches a certain point in its diagonal movement, the inner end of the arm 13 is moved beneath the edge of the turntable and into the path of a projection, such as a pin 13^a, depending from the under side of the turn-table. The pin 13^a coming in contact with the arm 13 moves the same about its pivotal center and causes the connecting rod 15 to actuate the lever 14 of the brake 8 to check the movement of the turntable. The inward movement of the bar 9 is controlled by suitable means connected with the sound-reproducing device 6, and, in the present instance, this means comprises a finger 20 supported from the arm 4 which carries the sound-reproducing device and is mounted thereon by means of a sleeve 21. The lower end of the finger 20 extends in the path of the bar 9 and serves to control the inward movement thereof. As the sound-reproducing device 6 moves over the record, the arm 4 moves about its pivotal center and the finger 20 is carried with the same and is moved diagonally of the base 10 along a line which intersects the line of movement of the bar 9. Consequently, as the sound-reproducing device approaches the end of the record, the finger 20 will have been moved inwardly a distance such as to cause the further movement of the bar 9 to move the arm 13 into the path of the stop 13^a. Thus the arm 13^a will be positively moved about its pivotal center and will actuate the stop-controlling member 14 and the stop 8 will be caused to engage the edge of the turn-table. In order to instantly actuate this brake we prefer to provide the bar 9 with an offset which is so located on the bar that the finger 20 will reach the same and pass off the shoulder formed thereby immediately after the sound-reproducing device reaches the end of the record. This offset is preferably formed in the bar 9 by forming the same in two parts, the main portion of the bar being provided with a reduced extension 22 upon which is mounted the outer end 23 of the bar which is pro-

vided with a thumb-nut 24 for holding the same in its adjusted position thereon. The width of the portion 23 of the bar 9, which portion is that engaged by the finger 20, is greater than the width of the extension 22 to the bar 9. Consequently, a shoulder 25 is formed, this shoulder being of a depth such that when the finger 20 passes beyond the same, the bar 9 will be moved quickly forward and the arm 13 brought into the path of the pin on the turn-table, and the engagement of the pin with the arm will actuate the brake and instantly stop the movement of the record. By making the outer portion 23 of the bar 9 adjustable, the location of the shoulder 25 can be adjusted to accommodate the same to records of different size, thus enabling the machine to be stopped at the end of the record, regardless of the size of that record. However, in order to insure that the finger 20 will pass beyond the shoulder 25 immediately upon the sound-reproducing device reaching the end of the record, we prefer to form in the record a groove 26 which forms an extension of the record groove and turns sharply toward the center of the disk, as shown, thus carrying the needle inwardly, and, consequently, moving the finger 20 quickly through a considerable distance, which distance is sufficient to insure that said finger will pass beyond the shoulder 25 and thus permit the bar 9 to move inwardly a distance sufficient to actuate the brake 8. Means are also provided for retaining the bar 9 in its open position against the tension of the spring 19 when it is so desired, and this means preferably consists of a spring-clip 27 secured to the base 10 and adapted to engage the bar 9 and hold the same against movement when it is desired to render the device inoperative. When it is desired to place the device in operation the bar 9 is moved forward until the forward edge thereof extends beyond the clip 27 and the bar 9 is again under the control of the spring 19 and the finger 20.

The operation of the device will be obvious from the foregoing description and it will be apparent that we have provided automatic means for controlling the brake or stop mechanism which controls the movement of the record-supporting means; that this means is controlled by a part connected with the sound-reproducing device and is so adjustable that the movement of the record will be stopped immediately after the sound-reproducing device has reached the end thereof, thus avoiding the defacing of the record and also doing away with the unpleasant sounds caused thereby. It will also be apparent that the stop-controlling member is positively actuated by the pin on the turntable coming into contact with the arm

which is connected with said stop-controlling member, thereby rendering the operation of the device certain.

We wish it to be understood that we do not desire to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

Having thus fully described our invention, what we claim as new and desire to secure by Letters Patent, is:—

1. In a talking machine, the combination, with a movable record, a sound-reproducing device adapted to move over said record, a stop for controlling the movement of said record, and a stop-controlling member, of a spring-pressed member for actuating said stop-controlling member, and a part connected to and adapted to move with said sound-reproducing device and lying normally in the path of said spring-pressed member for controlling the movement thereof.

2. In a talking machine, the combination, with a movable record, an arm movably supported above said record, a sound-reproducing device carried by said arm and adapted to move over said record, a stop for controlling the movement of said record, and a stop-controlling member, of a movable bar operatively connected to said stop-controlling member, a spring tending to move said bar in one direction, and a finger carried by said arm and normally extending into the path of said bar to control its movement.

3. In a talking machine, the combination, with a movable record, an arm movably supported above said record, a sound-reproducing device carried by said arm and adapted to move over said record, a stop for controlling the movement of said record and a stop-controlling member, of a base, a bar, links for connecting said bar to said base, a spring for actuating said bar, means for operatively connecting said bar to said stop-controlling member, and a part connected with said arm for controlling the movement of said bar.

4. In a talking machine, the combination, with a movable record, an arm movably supported above said record, a sound-reproducing device carried by said arm and adapted to move over said record, a stop for controlling the movement of said record and a stop-controlling member, of a base, a bar, links connecting said base to said bar, a spring for actuating said bar, an arm pivotally connected at one end to said bar, a rod connecting said arm to said stop-controlling member, and a part connected with the first-mentioned arm for controlling the movement of said bar.

5. In a talking machine, the combination, with a movable record, an arm movably

supported above said record, a sound-reproducing device carried by said arm and adapted to move over said record, a stop for controlling the movement of said record, and a stop-controlling member of a movable bar having a shoulder, means for actuating said bar, means for actuating said stop-controlling member from said bar, and a finger carried by said arm and adapted to engage said bar near said shoulder.

6. In a talking machine, the combination, with a movable record, an arm movably supported above said record, a sound-reproducing device carried by said arm and adapted to move over said record, a stop for controlling the movement of said record and a stop-controlling member, of a two part bar having one part movably connected to the other and forming a shoulder thereon, means for actuating said bar, means for operatively connecting said bar to said stop-controlling member, and a finger carried by said arm and adapted to engage said bar near said shoulder.

7. In a talking machine, the combination, with a record, a movable support therefor having a projection, a stop for controlling the movement of said support, and a sound-reproducing device adapted to move over said record, of a base, a bar movably mounted on said base, an arm carried by said bar and operatively connected at a point removed from the end thereof with said stop, means for actuating said bar to move the end of said arm into the path of said projection, and means connected with said sound-reproducing device for controlling the movement of said bar and said arm.

8. In a talking machine, the combination, with a movable record, an arm movably supported above said record, a sound-reproducing device carried by said arm and adapted to be moved over said record, and a stop for controlling the movement of said record, of a base, a bar movably connected to said base, a spring for actuating said bar, means for operatively connecting said bar to said stop, and a part connected with said arm and controlling the movement of said bar.

9. In a talking machine, the combination, with a movable record, an arm movably supported above said record, a sound-reproducing device carried by said arm and adapted to move over said record, and a stop for controlling the movement of said record, of a movable bar having a shoulder, a spring for actuating said bar, a finger carried by said arm, extending in front of said bar and adapted to engage the same near said shoulder, and a connection between said bar and said stop, whereby, said stop will be actuated when said finger passes said shoulder.

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10. In a talking machine, the combination, with a movable record, a sound-reproducing device carried by said arm and adapted to move over said record, and a
5 stop for controlling the movement of said record, of a two part bar having one part movably connected to the other and forming a shoulder thereon, means for actuating said bar, means for operatively connecting
10 said bar to said stop, and a finger carried

by said arm adapted to engage said bar near said shoulder.

In testimony whereof, we affix our signatures in presence of two witnesses.

DELPHOS C. NELSON.
JAMES W. NELSON.

Witnesses:

W. E. CHRISTMAN,
L. B. McNEAL.

982,132

H. G. LEHNERT.
MUSICAL INSTRUMENT.
APPLICATION FILED JUNE 8, 1910.

982,732.

Patented Jan. 24, 1911.

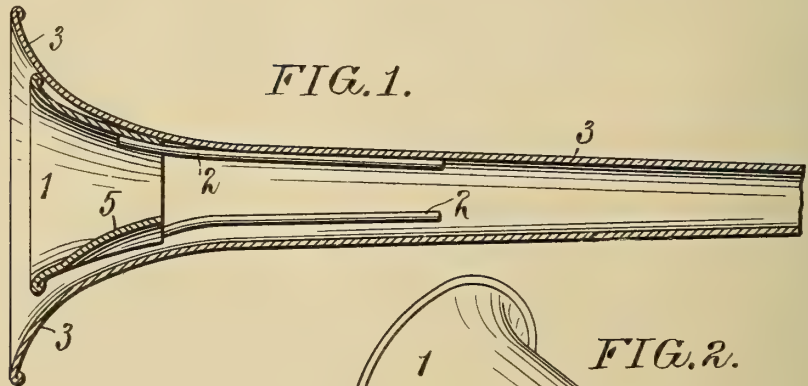


FIG. 1.

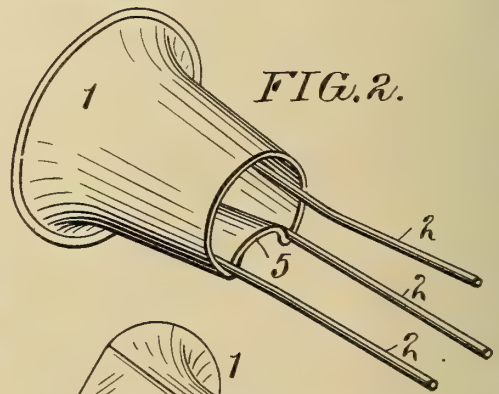


FIG. 2.

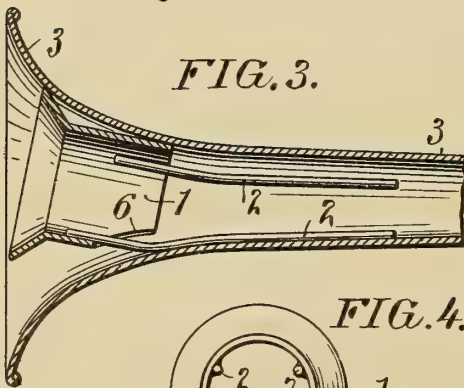


FIG. 3.

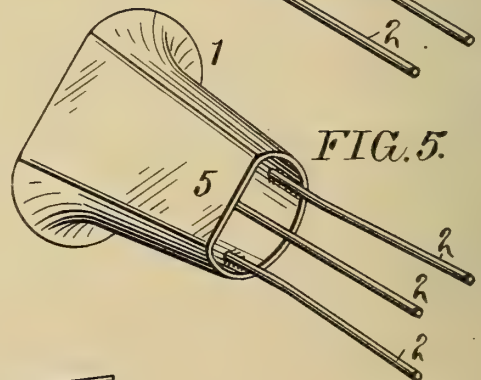


FIG. 5.

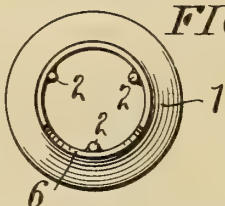


FIG. 4.

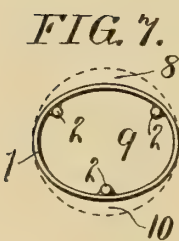


FIG. 7.

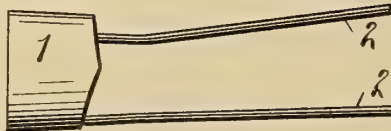


FIG. 6.

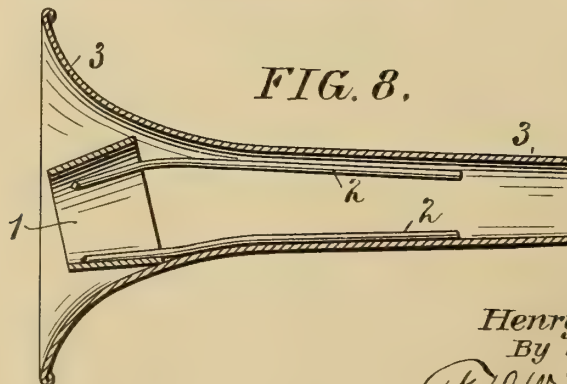


FIG. 8.

Witnesses:
M. B. Cleland
A. H. Marcus

Inventor:
Henry G. Lehnert
By his Attorney
A. H. Witt Goodwin

UNITED STATES PATENT OFFICE.

HENRY G. LEHNERT, OF PHILADELPHIA, PENNSYLVANIA.

MUSICAL INSTRUMENT.

982,732.

Specification of Letters Patent.

Patented Jan. 24, 1911.

Application filed June 8, 1910. Serial No. 565,679.

To all whom it may concern:

Be it known that I, HENRY G. LEHNERT, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Musical Instruments, of which the following is a specification.

My invention relates to improvements in musical instruments and particularly relates to horns, cornets, bugles, trumpets and other wind instruments.

The object of my invention is to provide a device which may be inserted into the bell of such musical instruments for the purpose of increasing the volume of sound emitted from the instrument and for correcting any defects in the tone and tune of the instrument.

A further object of my invention is to provide means for adjustably securing the device in the bell of a musical instrument.

Referring to the accompanying drawings, in which like references refer to like parts: Figure 1 is a longitudinal section of the bell end of a horn or cornet showing my device inserted therein; Fig. 2 is a perspective view of my improved sound increasing device, as shown in Fig. 1, detached; Fig. 3 is a view similar to Fig. 1 showing a different form of my device; Fig. 4 is an end view of the device as shown in Fig. 3, detached; Fig. 5 is a perspective view of a still different form of my invention; Fig. 6 is a side elevation of a still different form of my device; Fig. 7 is an end view of Fig. 6; and, Fig. 8 is a longitudinal sectional view of the bell end of a horn showing a still different form of my invention inserted in the same.

My invention consists of the member 1, having wires 2 secured thereto, which project beyond the end of the member 1 and are adapted to be inserted into the bell end of a musical instrument 3, for holding the member 1 in its proper place in the curved or conical portion of the bell of the musical instrument.

The member 1 may be made conical or bell shaped with a concaved portion 5 at the rear end thereof as shown in Figs. 1 and 2. The member 1 is inserted in the horn 3 and the wires 2 secured to said member 1 are bent and adjusted so that they will hold said member 1 against one side of the bell 3 of the horn, as shown in Fig. 1

so that the concaved portion 5 of the member 1 will be separated from the bell of the horn to form a space between the member 1 and the bell of the horn.

When the instrument is sounded the sound-waves will be divided into two columns, one passing through the main or central opening through the member 1 and the other column of air passing through the space formed between the bell of the horn and the concaved portion 5 of the member 1, which will greatly increase the volume of the sound and tone of the instrument.

Instruments of different sizes and manufacture require different forms of my sound-wave increasing device and some instruments require the device to be so placed in the bell thereof that the smaller air passageway will be formed at the top of the bell, as shown in Fig. 8, instead of at the bottom, as shown in Fig. 1.

It is desirable to make the device so that it may be adjustably secured in a horn. The wires 2 attached to the member 1 are capable of being bent to hold the member 1 in any desired position in the horn and said wires have sufficient rigidity to hold the member 1 tightly against the bell of the horn to prevent any vibration or rattling when the instrument is sounded.

The form of device shown in Fig. 3 has the member 1 made with a cylindrical body, having a cut-away portion 6 to allow the sound-waves to pass between the member 1 and the bell of the horn. Fig. 5 illustrates a device differing from that shown in Figs. 1 and 2 only in so far as the portion 5 is made flat instead of concaved and is better suited for some particular instruments.

The form shown in Figs. 6 and 7 illustrates an elliptical member 1 which is adapted to divide the sound waves into three columns 8, 9 and 10. The dotted circle shown in Fig. 7 represents the cross-section of the horn at the points of contact with the member 1 and Fig. 8 illustrates a conical member 1 having the wires 2 bent to hold said member against one side of the bell 3 of the instrument.

Each of the above forms of devices has been found to be better suited to particular forms and sizes of instruments and I therefore do not wish to limit my invention to any particular shape of sound wave dividing members.

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Having thus described my invention I claim and desire to secure by Letters Patent:

1. In a sound producing instrument having a horn, a sound wave dividing member consisting of a hollow tube having a portion of its inner end curved to conform with the cross section of the horn and adapted to be held in contact with the inner surface of said horn, said tube having a portion of the periphery of the inner end thereof shaped so as to form a passageway between the tube and the inner surface of the horn and means for adjustably holding said tube in said horn.

2. In a sound producing instrument hav-

ing a horn, a sound wave dividing member consisting of a hollow tube having a portion of its inner end shaped to conform with the cross section of the horn, said tube having a portion of the periphery of its inner end shaped to form a passageway between the tube and the inner surface of the horn and wires secured to the inner end of said tube and projecting therefrom for adjustably holding said member in the horn.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY G. LEHNERT.

Witnesses:

ARTHUR G. PENTON,
M. R. CLEELAND.

J. JETTER.

STYLUS OR NEEDLE FOR SOUND RECORDING AND REPRODUCING MACHINES.

APPLICATION FILED AUG. 2, 1906.

983,061.

Patented Jan. 31, 1911.

Fig. 4

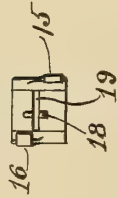


Fig. 3

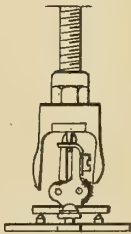


Fig. 2.

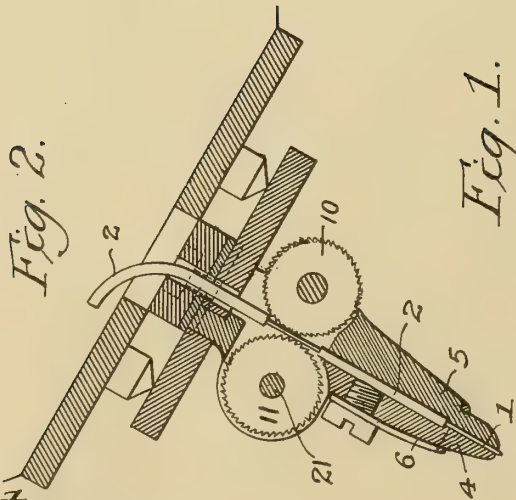
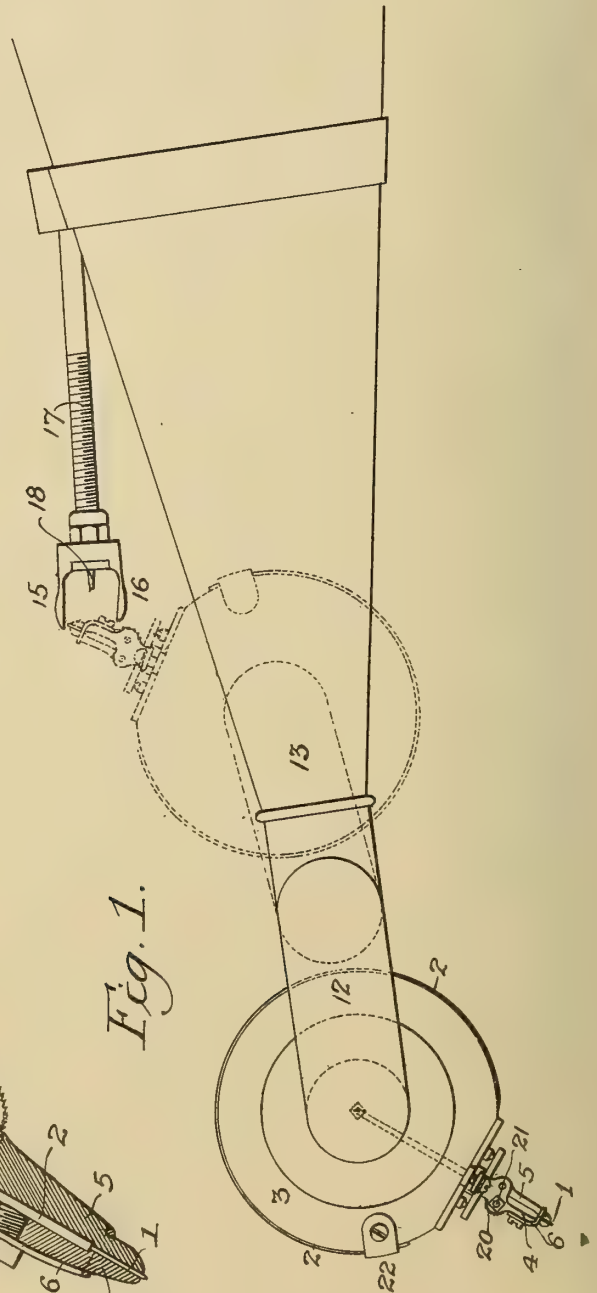


Fig. 1.



Witnesses:
Walter S. Pullinger.
Murray C. Boyer

Inventor
Julius Jetter
 by his Attorneys
Howan & Howan

UNITED STATES PATENT OFFICE.

JULIUS JETTER, OF CAMDEN, NEW JERSEY.

STYLUS OR NEEDLE FOR SOUND RECORDING AND REPRODUCING MACHINES.

983,061.

Specification of Letters Patent.

Patented Jan. 31, 1911.

Application filed August 2, 1906. Serial No. 328,955.

To all whom it may concern:

Be it known that I, JULIUS JETTER, a citizen of the United States, and a resident of Camden, Camden county, New Jersey, have invented an Improved Stylus or Needle for Sound Recording and Reproducing Machines, of which the following is a specification.

My invention relates to the sound recording and reproducing mechanism of phonographs and other sound recording and reproducing instruments, and it consists of an improved form of stylus or needle applicable more particularly to the reproduction of sound from disk records.

My invention comprises further means for adjusting or feeding such stylus or needle whereby all wear upon the same is compensated for.

In the accompanying drawings illustrating my invention: Figure 1 is a view in elevation of a sound-box carrying the improved form of stylus forming the subject of my invention, showing the same in the position of use, and showing also, in dotted lines, the position of the sound-box when it becomes necessary to feed the needle or stylus forward, and Figs. 2, 3, and 4 are views illustrating details of my invention.

The needle or stylus made in accordance with my invention, consists of hard steel wire, preferably piano wire, of a gage sufficiently fine to provide the necessary point to fit the groove of the record. This wire, indicated at 1 in the accompanying drawing, is carried by a tubular body or holder 2, encircling the casing 3 of the sound box or reproducer, and it extends between jaws 4 and 5 which are normally held together by a spring 6. The wire forming the needle or stylus is so disposed that but a short piece projects beyond the end of the jaws, sufficient only to engage the groove of the record.

Carried by each of the jaws and in engagement with the wire are milled wheels 10 and 11, and by turning these wheels by suitable means the wire may be fed after it becomes worn. This feeding operation is accomplished in the following manner: The sound box or reproducer is carried by an arm 12 jointed to another arm 13 to which the usual horn may be attached; the arm 12 being so arranged that the reproducer may be lifted at regular interval to permit either a resetting for another reproduction of the same record or for the placing of a new

record, and when this lifting is done the feeding operation may take place.

Disposed in proper position with relation to the jaws carrying the stylus when the sound-box or reproducer is lifted and swung on its pivot, are pawls 15 and 16 carried by a pivoted and adjustable stem 17, which has also a pair of fingers 18 disposed in such position as to pass over the jaws 4 and 5 and engage the spring 6 normally closing said jaws, and displace it to a certain extent. The head carrying these pawls and fingers is also slotted at 19 for the passage of the needle or stylus point. When the release of the spring 6 takes place, one of the pawls engages the milled wheel 10 in engagement with the needle or stylus and the other pawl engages a supplementary wheel 20, also milled, carried on the stem or spindle 21 of the other milled wheel 11 in engagement with said needle or stylus. The total movement effected by the pawls is very slight, but it is enough to keep the stylus projected a sufficient distance for the work, thereby avoiding the constant replacing of new points as is common with the sound-boxes or reproducers in ordinary use.

The tube 2 containing the wire, which may be of rubber, is preferably held down by a suitable clamp 22, and if desired a number of these clamps may be disposed around the casing of the sound box or reproducer.

I claim:

1. The combination of a sound box for sound recording and reproducing machines, a continuous length stylus carried by said sound box, a pivotal mounting for said box, and means brought into action by the movement of the sound box on its pivot for engaging and feeding said stylus.

2. The combination with a sound box for sound recording and reproducing machines, of a continuous stylus, jaws between which the same is fed and a spring for closing said jaws.

3. The combination with a sound box for sound recording and reproducing machines, of a continuous style, encircling the sound box, jaws between which said stylus is disposed, said sound box being mounted for pivotal movement, and means brought into operation by the movement of the sound box on its pivot for feeding the stylus between said jaws.

4. The combination with a sound box for sound recording and reproducing machines,

110

of a continuous stylus, means for feeding the same, jaws between which the stylus is disposed, and means for closing said jaws, such means being engaged by the feeding mechanism to cause the jaws to open slightly.

5 5. The combination with a sound-box for sound recording and reproducing machines, of a continuous stylus, means for feeding the same, jaws between which the stylus is
10 led, and a spring arm for closing said jaws, said arm being engaged by the feeding mechanism to permit the jaws to open slightly.

6. The combination with a sound-box for
15 sound recording and reproducing machines, of a continuous stylus of wire encircling the sound-box casing.

7. The combination with a sound-box for sound recording and reproducing machines,
20 of a continuous stylus of hard steel wire encircling the sound-box, and a covering for the same.

8. The combination with a sound-box for sound recording and reproducing machines,
25 of a continuous stylus of wire, a tubular covering inclosing the same, and means for feeding said stylus, the covering being discontinued at the point of engagement of the feeding means.

9. The combination with a sound-box for sound recording and reproducing machines,
30 of a continuous stylus of hard steel wire, a tubular covering inclosing the same, and means for feeding said stylus, the covering
35 being discontinued at the point of engagement of the feeding means.

10. The combination with a sound-box for sound recording and reproducing machines,
40 of a continuous stylus, a pair of jaws between which the same is led, feeding wheels in engagement with said stylus, and means for operating said wheels.

11. The combination with a sound-box for sound recording and reproducing machines,
45 of a continuous stylus, a pair of jaws between which the same is led, milled feeding wheels in engagement with said stylus, and means for operating said wheels.

12. The combination of a sound-box for
50 sound recording and reproducing machines, a pivotal mounting for the same, a continuous stylus, jaws between which the same is led, milled wheels carried by said jaws in engagement with the stylus, and means in
55 the path of movement of the sound-box on its pivot for engagement with said milled wheels whereby the stylus can be fed through such engagement.

13. The combination of a sound-box for

sound recording and reproducing machines, 60
a pivotal mounting for the same, a continuous stylus, jaws between which the same is led, milled wheels carried by said jaws in engagement with the stylus, and pawls mounted in the path of the sound-box when
65 turned on its pivot for engagement with said milled wheels whereby the stylus can be fed through such engagement.

14. The combination of a sound-box for sound recording and reproducing machines, 70
a pivotal mounting for the same, a continuous stylus, jaws between which said stylus is led, milled wheels engaging said stylus, pawls for engaging said wheels, a stem carrying said pawls, and a pivotal mounting 75
for the same.

15. The combination with a sound-box for sound recording and reproducing machines, of a pivotal mounting for the same, a continuous stylus carried thereby, jaws for guiding said stylus, milled wheels for feeding the stylus, a pivoted member having pawls for engagement with said wheels to move the stylus, a spring tending to close said jaws, and projecting means carried by said pawl
85 carrying member for engaging said spring, releasing the jaws and permitting the stylus to be fed through the same.

16. The combination of a sound box for sound recording and reproducing machines, 90
a continuous stylus, a protective covering for the same, jaws carried by said sound box between which the stylus is disposed, said protective covering being discontinued adjacent the jaws, and movable means directly
95 engaging said stylus for feeding the same longitudinally between said jaws.

17. The combination of a sound box for sound recording and reproducing machines, a continuous stylus, jaws between which the
100 stylus is disposed, means for feeding the stylus longitudinally through said jaws, and means for closing said jaws.

18. The combination of a sound box for sound recording and reproducing machines. 105
a continuous stylus, self-closing jaws carried by said sound box between which the stylus is fed longitudinally, and movable means directly engaging said stylus to impart the longitudinal movement to the same. 110

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

JULIUS JETTER.

Witnesses:

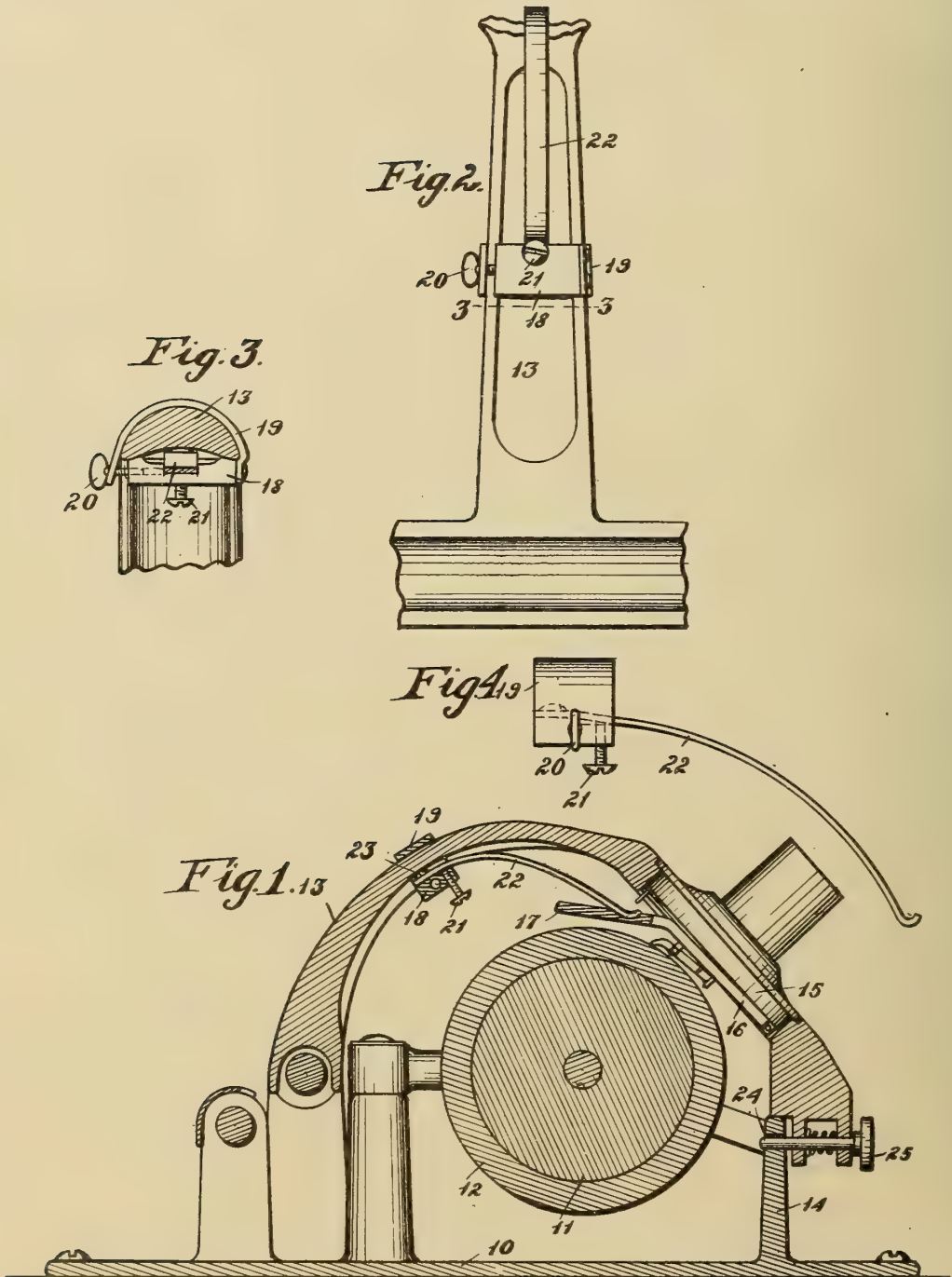
FREDRICK FORSTER,
WILLIAM JETTER.

915/5

W. W. McCAULEY.
 PHONOGRAPH.
 APPLICATION FILED MAY 5, 1910.

983,155.

Patented Jan. 31, 1911.



Witnesses.
 W. A. S. S. S.
 F. C. Caswell

Inventor
 William W. McCauley.
 by Ralph D. D. D. D.

UNITED STATES PATENT OFFICE.

WILLIAM W. McCAULEY, OF MADRID, IOWA.

PHONOGRAPH.

983,155.

Specification of Letters Patent.

Patented Jan. 31, 1911.

Application filed May 5, 1910. Serial No. 559,513.

To all whom it may concern:

Be it known that I, WILLIAM W. McCAULEY, a citizen of the United States, residing at Madrid, in the county of Boone and State of Iowa, have invented a certain new and useful Phonograph, of which the following is a specification.

My invention relates to that class of phonographs in which the reproducing disk is provided with a weighted extension to yieldingly hold same in engagement with a phonographic record.

My object is to provide a device in the nature of an attachment that may be applied to phonographs of this class to apply a yielding pressure to the reproducing disk in order to yieldingly hold the reproducer to the record so that shocks and jars to the phonographic instrument will be prevented from throwing the reproducer out of its proper path of travel on the phonographic record so that in using extremely hard records of the kind ordinarily called indestructible records the follower may be held firmly to the record to thereby more accurately reproduce the sounds than is possible with a reproducing instrument that is held toward the record by a weight only.

My object is further to provide convenient means for adjusting the spring tension to meet the requirements of use.

My invention consists in certain details, in the construction, arrangement and combination of the various parts of the device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claim and illustrated in the accompanying drawings, in which:

Figure 1 shows a sectional view of a part of an ordinary phonograph having my improved spring pressure appliance connected therewith. Fig. 2 shows an enlarged, detail view of the arm that supports the reproducer of a phonograph with my improved spring attachment applied thereto. Fig. 3 shows a sectional view on the line 3-3 of Fig. 2, and Fig. 4 shows a side elevation of the attachment disconnected from the phonographic instrument.

Referring to the accompanying drawings, I have used the reference numeral 10 to indicate the frame of a phonograph, 11 the record cylinder and 12 the record. Hinged to the frame is an arm 13 having its free end slidingly mounted upon a guide 14. The said arm carries a reproducer 15 and a disk

16 is pivotally connected therewith and provided with a weighted extension 17 to yieldingly hold the disk 16 toward the record. All of the parts above described are of the ordinary construction now in general use and a further detailed description thereof is deemed unnecessary.

My improvement consists in the nature of an attachment that may be applied to any of the phonographs of the class above mentioned.

It consists of a metal block 18 designed to fit against the under surface of the arm 13. At one side of the block I have fixed a metal strap 19 which is designed to pass over the reproducer arm and which is provided with a set screw 20 having its end seated in the side of the block 18 opposite from the side to which said strap is fixed so that the block may be adjustably and detachably connected with the arm and so that it may be firmly fixed in any position in which it is placed. Extended through the block 18 from its under side is a set screw 21 for purposes hereinafter made clear.

The spring for engaging the reproducing disk comprises a curved body portion 22 having one end inserted between the block 18 and the arm 13 and preferably provided with a rounded lug 23 to engage the arm 13. The other end of the spring is placed in position against the upper surface of the extension 17 and is preferably placed in a small groove in said extension 17 to thereby prevent lateral movement of the extension relative to the spring. The arrangement of this spring is such that its tension, as applied to the extension 17, can be adjusted and regulated by a manipulation of the set screw 21. In addition to this I have provided means whereby the sliding carriage containing the arm 13 may be held against up and down movement so as to smoothly and evenly slide from one end of the frame to the other as follows: In the guide 14, I have provided a longitudinal slot 24 and in the overlapping part of the arm 13, I have provided a spring actuated pin 25 designed to enter said slot and be yieldingly held therein by the spring. When this pin is in the slot it prevents up and down movement of the arm 13 and when it is desired to raise the arm the operator grasps the pin and pulls it forwardly until it is out of the slot and then elevates the arm.

In practical operation it is obvious that

the block 18 may be readily, quickly and easily attached and firmly secured in position on the arm of a phonographic instrument with the spring 22 thereof in engagement with the weighted extension 17 of the reproducer. The tension of said spring may be varied to suit the requirements of an adjustment of the set screw 21. I have found that with a reproducer having a weighted extension only, any jarring motion applied to the support on which the phonograph stands will tend to cause the reproducer arm to vibrate up and down to an extent sufficient to interfere with the reproduction of sound and in some instances the reproducing point will even move laterally relative to the record out of its normal path of travel, thus wholly interrupting the continuous reproduction of sounds as recorded on the record. The application of the spring serves a number of important functions. First, it will yieldingly hold the reproducer toward the record in such a manner as to prevent rebound of the reproducing point relative to the record and in addition to this it prevents lateral movements of the reproducing disks and point so that the point will not pass out of the groove in the record even though the instrument is moved or jarred during the process of reproducing sounds thereon. This attachment is of especial advantage in connection with the use of records of the kind known as indestructible records which are hardened so that the reproducing points will not wear the records. Further when such hard records are used there is more tendency for the reproducing point to vibrate and be shaken out

of the normal path of travel on the record and I have found that by means of the improved spring attachment the reproducing point may be guided more accurately and held more firmly to the record than by the use of the weighted extension alone regardless of the amount of the weight. 40 45

I claim as my invention:

The combination with a phonograph having a reproducing disk and a weighted extension connected with said disk for normally holding the reproducing disk toward a record, said weighted extension being provided with a notch in its upper surface and an arm for supporting said disk, of a block placed adjacent to the under surface of the arm, a flexible strip fixed at one end to the block, and passed around the top of the arm and having a set screw therein seated in the block for adjustably and detachably securing the block to the arm, a spring having a rounded lug thereon interposed between the block and the arm with its rounded lug in engagement with the arm, a set screw seated in the block to engage the spring, the said spring being extended to position with its free end resting in the notch of said weighted extension for applying a yielding pressure to the weighted extension and for limiting the lateral movements of said weighted extension, substantially as and for the purposes stated. 50 55 60 65 70

Des Moines, Iowa, March 12, 1910.

WILLIAM W. McCAULEY.

Witnesses:

MARY WALLACE,
W. A. LOFTUS.

913,1

E. M. TURNER.
PHONOGRAPH.

APPLICATION FILED DEC. 27, 1909.

983,183.

Patented Jan. 31, 1911.

3 SHEETS—SHEET 1.

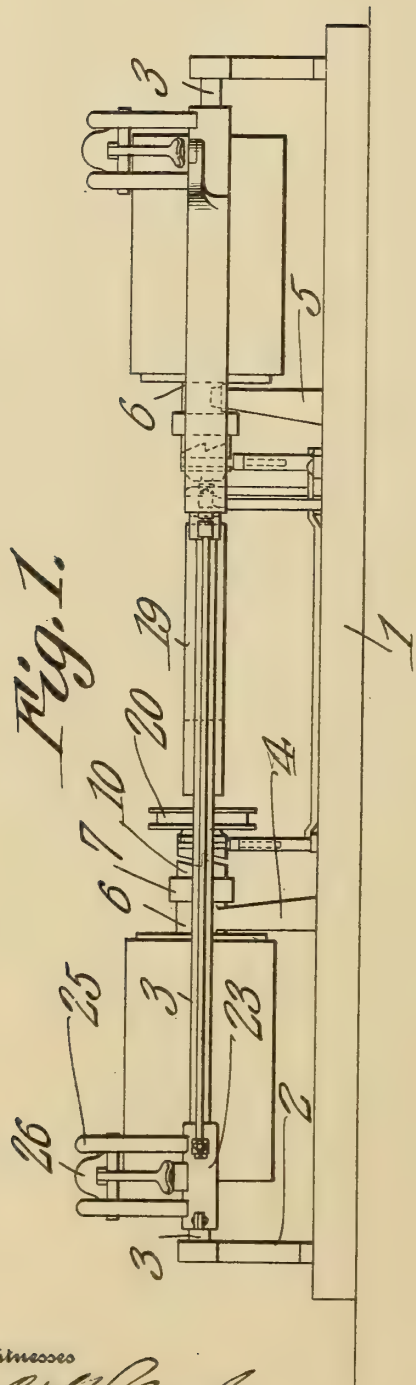


Fig. 1.

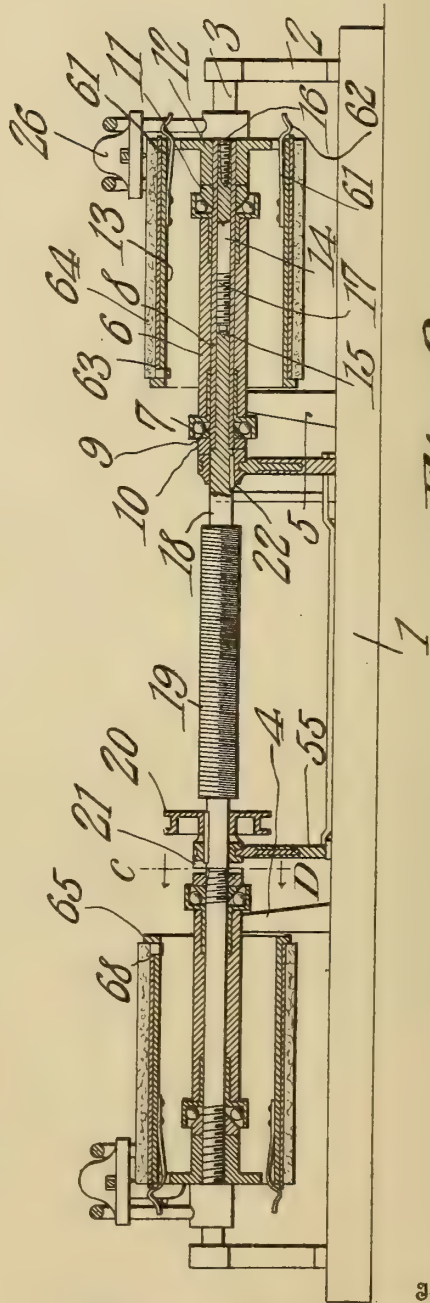


Fig. 2.

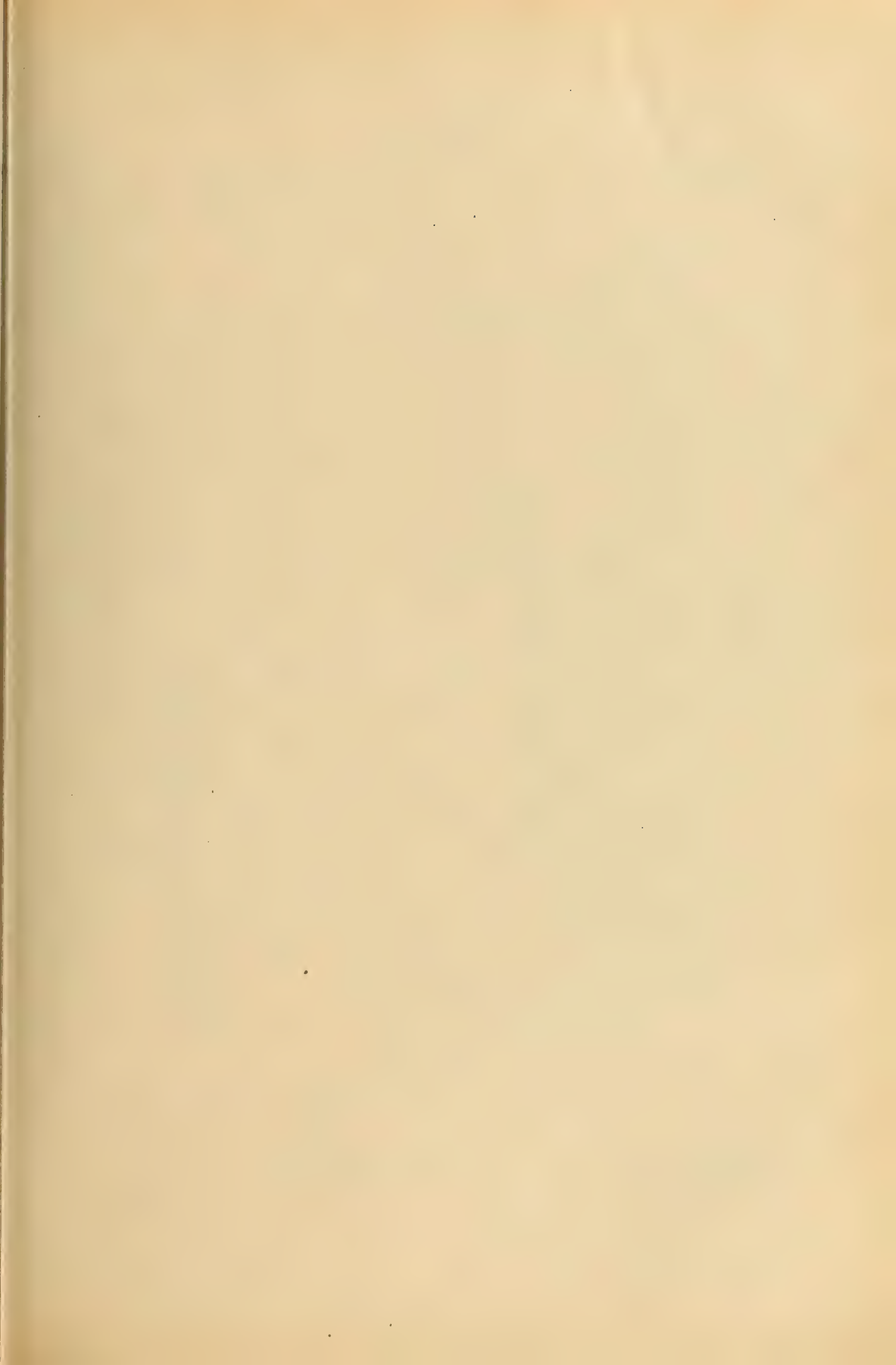
Witnesses

E. M. Turner
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PHONOGRAPH.

APPLICATION FILED DEC. 27, 1909.

983,183.

Patented Jan. 31, 1911.

3 SHEETS—SHEET 2.

Fig. 3.

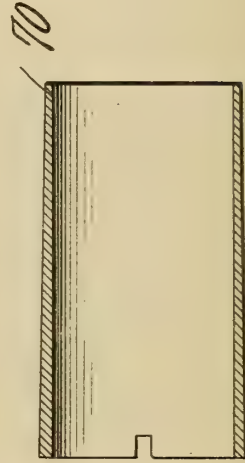
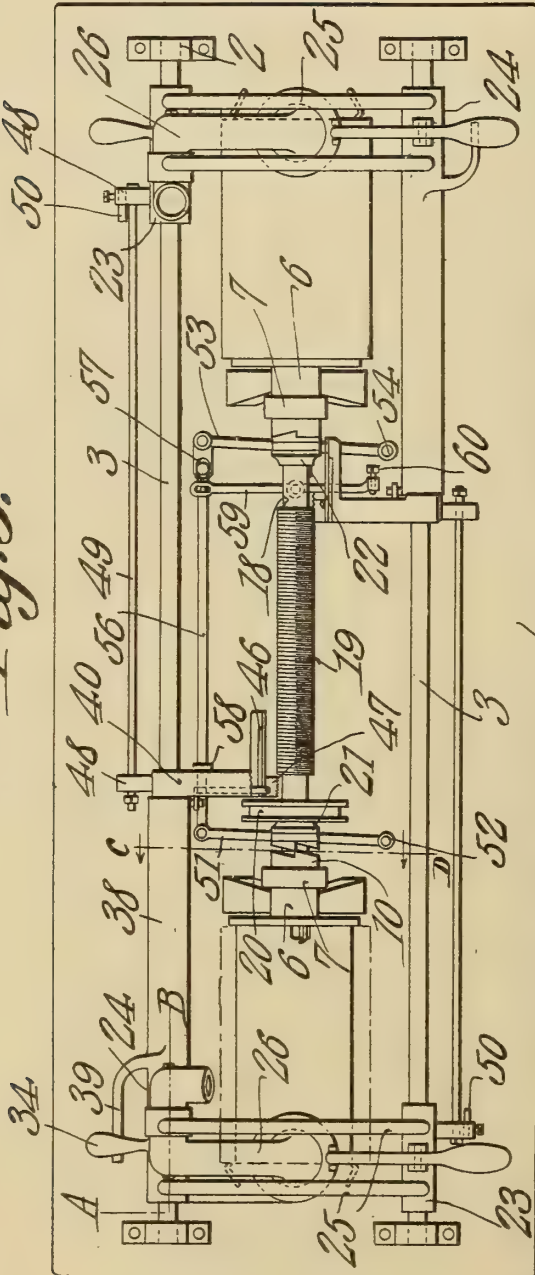


Fig. 5.

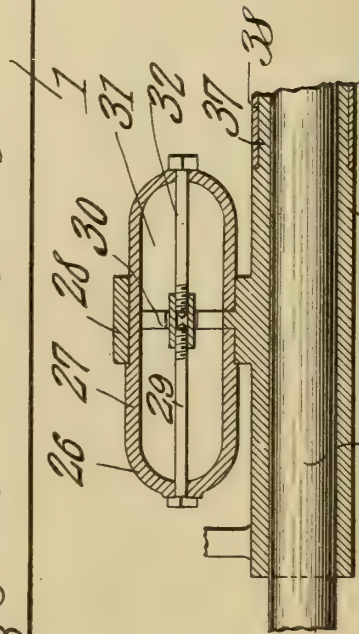


Fig. 4.

Witnesses

E. J. Stewart
F. T. Chapman

Inventor

Estey M. Turner.

384

Cashow & Co.
Attorneys

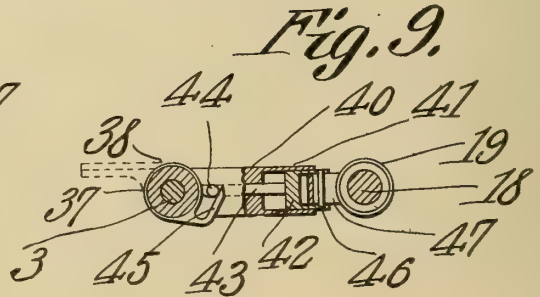
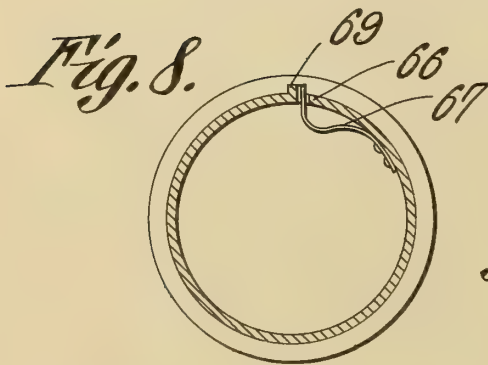
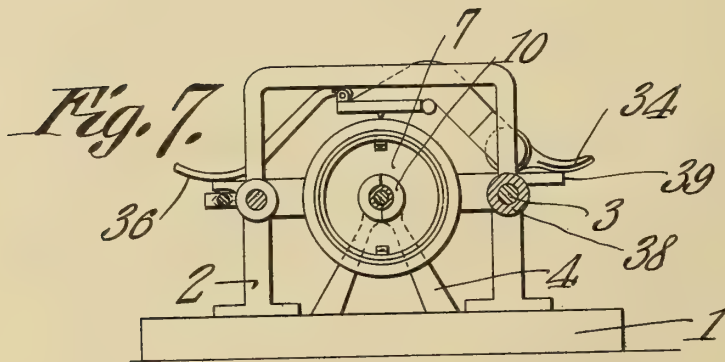
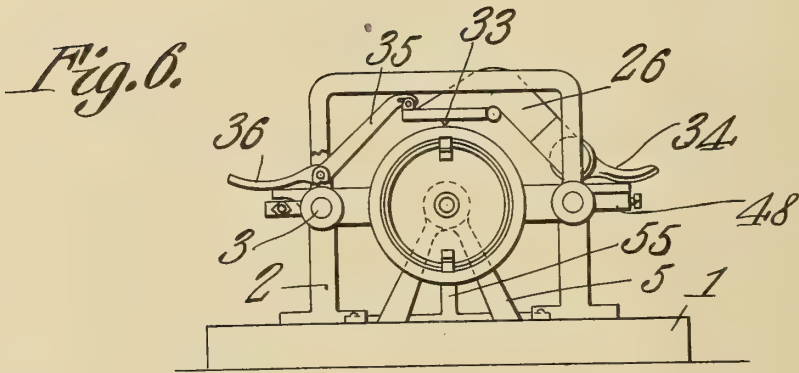
E. M. TURNER.
PHONOGRAPH.

APPLICATION FILED DEC. 27, 1909.

Patented Jan. 31, 1911.

3 SHEETS—SHEET 3.

983,183.



Inventor

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J. F. Chapman.

UNITED STATES PATENT OFFICE.

ESTEY MURRELL TURNER, OF PASADENA, CALIFORNIA.

PHONOGRAPH.

983,183.

Specification of Letters Patent.

Patented Jan. 31, 1911.

Application filed December 27, 1909. Serial No. 534,920.

To all whom it may concern:

Be it known that I, ESTEY M. TURNER, a citizen of the United States, residing at Pasadena, in the county of Los Angeles and State of California, have invented a new and useful Phonograph, of which the following is a specification.

This invention has reference to improvements in phonographs and is designed to produce a machine of this character with which the sound may be recorded or reproduced to as great an extent as desired even though far exceeding the limits of the record tablet, the structure being such that when the record on one tablet is about exhausted or the limits of the tablet are about reached, a second tablet will come into action automatically so that during the recording or reproducing of the sounds with the second tablet a third tablet may be placed on the machine after the removal of the first tablet and on the completion of the second tablet the third tablet will be automatically introduced into action, and this operation may be repeated indefinitely so long as the operator desires.

The invention will be best understood from a consideration of the following detail description taken in connection with the accompanying drawings forming a part of this specification, in which drawings,

Figure 1 is a side elevation of the machine. Fig. 2 is a central vertical section longitudinal of the machine. Fig. 3 is a plan view of the machine. Fig. 4 is a section on the line A-B of Fig. 3. Fig. 5 is a sectional view of a sleeve or adapter. Fig. 6 is an end elevation of the machine. Fig. 7 is a section on the line C-D of Fig. 3. Fig. 8 is an end view of one of the record mandrels illustrating the lock for the record tablet. Fig. 9 is a detail view of the mechanism for operating the feed nut.

Referring to the drawings there is shown a base 1, at the opposite ends of which are spaced standards 2 near opposite sides of the base and the standards carry rods 3 elevated at an appropriate distance above the base and extending from one end to the other at opposite sides of and at equal distances from the center line of the base. In the middle line of the base are two standards 4, 5, each having formed a part thereof or fixed thereto a sleeve 6 extending toward

the end of the base 1. These sleeves terminate at the ends or have secured to their ends ball cups 7. Mounted within the sleeves 6 are other sleeves 8 extending at each end through the ball cups. At one end, that is the end toward the middle of the base each sleeve 8 carries a ball cone 9 which may be attached to or form part of a clutch member 10 also mounted on the sleeve in fixed relation thereto. The other end of the sleeve 8 carries another ball cone 11 attached to or forming part of a hub 12 carrying at the end remote from the ball cup one end of a cylindrical mandrel 13 projecting over the sleeve 6 in concentric relation thereto and toward the middle of the base 1.

Entering the end of the sleeve 8 carrying the mandrel 13 is a screw pin 14 terminating at the inner end in a point 15 while at the outer end this pin is entered by a tapered screw 16 forcing it into firm engagement with the corresponding end of sleeves 8 thus uniting the pin 14 to the sleeve 8 in such manner that the pin may be adjusted longitudinally of the sleeve and then locked by the screw 16. The pin 14 is shown as provided with a portion 17 having screw threads formed thereon and this portion is designed to enter a correspondingly threaded portion of the interior of the sleeve 8.

Extending between the facing ends of the sleeves 8 is a shaft 18 having its intermediate portions provided with screw threads as shown at 19, this intermediate portion being preferably of greater diameter than the rest of the shaft and the screw threads are of a pitch such as is usually employed in sound recording and reproducing machines. The ends of the shaft 18 are reduced in diameter and enter the corresponding ends of the sleeves 8 and the extreme ends of the shaft are engaged by the pointed ends 15 of the pins 14 entering center cups in the ends of the shaft, these pointed ends 15 of the pins 14 serving as centering bearings for the shaft. Fast to the shaft 18 at one end of the threaded portion 19 is a pulley 20 by means of which rotative movement may be imparted to the shaft from any appropriate motor. This pulley 20 is to be taken as indicative of any manner of causing the rotation of the shaft 18 either by belt or otherwise.

At the portions of the shaft 18 adjacent

to the clutch members 10 are other clutch members 21 constrained to rotate with the shaft each by a spline 22 but which clutch members may be moved longitudinally of the shaft into and out of engagement with the respective clutch members 10 so that either one of the mandrels 13 may have rotative motion imparted thereto as may be desired.

Mounted on the rods 3 at each end of the machine is a carriage composed of two sleeves 23, 24. The sleeve 23 is mounted on one rod 3, while the sleeve 24 is mounted on the other rod 3 at the same end of the machine as is the sleeve 23, the two sleeves 23 and 24 at the same end of the machine being connected by yokes 25 so that the sleeves will move together.

The carriages are capable of moving along the rods 3 for a distance about equal to the length of the corresponding mandrel 13 and the length of the screw section 19 of the shaft 18 is such as to impart the appropriate motion to the two carriages as will hereinafter appear.

Each rod 3 carries a sleeve 23 near one end and the sleeve 24 of the other carriage near the other end. Mounted on the sleeve 23 at one end of the machine is a tubular arm 26 having an angle neck 27 seated in an annular bearing 28 carried by the corresponding sleeve and the arm 26 is held to the sleeve by a screw pivot 29 extending axially of the neck and entering an appropriate threaded socket 30 carried by the bearings 28. The free end of the neck 26 within the bearing 28 is in communication with another neck 31 similarly mounted in the bearing 28 by means of a screw 32 similar to the screw 29 and the other end of the neck 31 may receive any appropriate sound conveying conduit whether of the amplifying character or not.

The end of the tubular arm 26 remote from that formed into the neck 27 carries a sound box 33 either formed thereon or attached thereto and this sound box may be of any appropriate character, the construction of the sound box not entering into the present invention. In order that the sound box may be manipulated as desired, the arm 26 is formed with a manipulating handle or extension 34. Attached to the sound box 33 or to the corresponding end of the arm 26 there is one end of a lever 35 hinged to the opposite member 23 or 24 of the corresponding carriage and also provided with a manipulating extension 36 similar to the manipulating extension 34 of the arms 26.

The member 24 of the carriage is longer than the mandrel 13 and for a portion of its length is reduced in external diameter as indicated at 37 in Fig. 4, this reduced portion constituting a seat for a sleeve 38 capa-

ble of turning on the sleeve 24, and this sleeve 38 at the end toward the sound box is provided with an off-set arm 39 having its free end parallel with the axis of rotation of the sleeve and under-riding the handle or extension 34 so that when the latter is depressed the arm 39 will be engaged by said handle and the sleeve 38 will be given a short rotative movement about the axis of the member 24.

The end of the sleeve 24 remote from that carrying the hollow arm 26 in one case and the lever 34 in the other case has a lateral extension or arm 40 adjacent to the screw portion 19 of the shaft 18. This arm 40 is formed at the outer end with a recess 41 housing a block 42 provided with a stem 43 projecting into the arm toward the rod 3 and having its end adjacent to the rod 3 bent at an angle to project beyond the corresponding face of the arm 40 as shown at 44. The sleeve 38 adjacent to the arm 40 is provided with a finger 45 shaped to engage the end 44 of the rod or stem 43 in such manner as to cause the longitudinal movement of the block 42 in the recess 41 when the sleeve 38 is rotated in the proper direction. Outside the recess 41 the block 42 is engaged by a spring 46 tending to move the block 42 outward. The block 42 carries a nut section 47 adapted to the threaded portion 19 of the shaft 18.

The sleeves 23 and arms 40 are provided with meeting lugs 48 and through the corresponding lugs on the same side of the machine extends a rod 49 headed at each end beyond the lugs and capable of moving through said lugs. The lug 48 upon each sleeve 23 also carries an adjustable pin 50 so positioned as to make contact with the other lug 48 on the same side of the machine under conditions which will presently appear.

Mounted on the base 1 beneath the clutch member 21 is a lever 51, this lever being pivoted at one end to the base as indicated at 52.

Beneath the clutch member 20 is another lever 53 pivoted at one end of the base as indicated at 54. Rising from each lever is an arm 55 connected to the corresponding clutch member 21 or 22 as the case may be so that when the lever is moved on its pivot the clutch member will be moved longitudinally on the shaft 18 into or out of engagement with the meeting clutch member coupled to the corresponding mandrel. The two levers 51 and 53 have their pivot connections at one side of the center line of the machine and extend toward the other side of the machine where the free ends of the levers are connected by a link 56 so that these two levers are constrained to move together. The link 56 near the lever 53 carries an upwardly projecting pin 57 of sufficient height to be engaged by a lug or block 58 carried by

the arm 40 of the sleeve 24 on the corresponding side of the machine.

Pivotaly connected to the link 56 near the pin 57 is one end of a lever 59 pivoted to the base about the center line thereof, that is, beneath the shaft 18, and this lever extends to the other side of this center line and into the path of the arm 40 of the carriage member 24 on the corresponding side of the machine. The free end of this lever carries a set screw 60 so that the relative time of contact of the arm 40 with the lever may be adjusted.

The accessible end of each mandrel 13 is provided with elastic fingers 61 preferably at diametric points within the mandrel and the free ends of the spring fingers project beyond the free end of the mandrel and are there bent as indicated at 62 to normally project beyond the periphery of the mandrel in the path of a record tablet to be placed thereon. In the particular structure shown in the drawings the record tablets each consist of a metallic sleeve 63, or this sleeve may be formed of any other suitable material, and exterior thereto there is a coating 64 of record receiving material of any suitable character. Such a tablet may be readily pushed on the mandrel 13, the spring fingers 61 yielding to such movement and when the tablet is on the mandrel to the full extent then the ends 62 of the spring fingers snap in the path of the tablet thus holding it on the mandrel.

The end of the mandrel remote from that onto which the tablet is first placed is provided with a radial circumferential flange 65 and adjacent to this flange the mandrel is provided with a perforation 66 through which extends the free end of a spring 67 fast to the interior of the mandrel. The sleeve 63 is provided with an end notch 68 entered by a radial lug 69 on the mandrel adjacent to the spring 67 and this spring is designed to have its free end enter the notch in the mandrel so as to take up any looseness of fit between the notch of the mandrel and the lug 69. The parts just described are designed to cause the tablet to rotate with the mandrel, without interference however with the ready removal of the tablet from the mandrel.

The mandrel 13 is cylindrical, but such mandrel may be made tapering, after the ordinary practice of cylinder record machines, or the mandrel 13 may be adapted to tablets with internal tapers by the employment of a taper bushing 70 shown in Fig. 5.

Let it be assumed that it is desirable to make a sound record much longer than is possible on a single tablet. Also let it be assumed that a suitable record tablet has been placed upon the mandrel at the right hand end of the machine and that the sound

is being recorded in the usual manner. In the position shown in Fig. 3 the sound box has reached about the limit of its travel toward the right and the arm 40 of the sleeve 24 of the carriage for the said sound box is brought into engagement with the screw 60 of the lever 59 and the actuation of this lever by the continued movement of the carriage causes a movement of the lever 53 in a direction to move the clutch member 22 out of engagement with the clutch member 10 and thus uncoupling the mandrel at the right hand end of the machine, as viewed in Fig. 3, from the shaft 18 which is assumed to be continuously rotating under the action of a suitable power applied thereto through the pulley 20 or by means of other driving devices.

As the clutch member 22 is being moved out of engagement with the clutch member 10, the clutch member 21 is being moved into engagement with the clutch member 10 of the other mandrel, that is the one at the left hand end of the machine, through the link connection 56 between the levers 53 and 51. The parts may be so adjusted that the coupling of the mandrel at the left hand end of the machine to the power shaft will take place just prior to the uncoupling of the mandrel at the right hand end of the machine from the power shaft.

The parts are so adjusted that just prior to the uncoupling of the mandrel at the right hand end of the machine from the power shaft the rods 49 are so moved by the progressive travel of the carriage at the right hand end of the machine as to have their other ends move the carriage at the left hand end of the machine a sufficient distance toward the right to bring the nut 47 of said carriage into engagement with the threaded portion 19 of the shaft 18 so that as the recording at the right hand end of the machine ceases it will begin at the left hand end of the machine. It is preferable that the recording should begin on the left hand end of the machine just prior to ceasing at the right hand end of the machine so that there is a slight overlapping, but with the machine properly adjusted this will not interfere with the reproduction of the sound. The recording proceeds continuously, and the operator by a suitable manipulation of the extensions 34 and 36 lifts the sound box 33 out of engagement with the record tablet, and this manipulation of the extensions 34 and 36 causes a rocking of the sleeve 28 by engagement of the extension 34 with the arm 39 to a sufficient extent to cause the finger 43 to operate on the pin end 43 and withdraw the nut 47 from engagement with the threaded portion 19 of the shaft 18. The carriage at the right hand end of the machine may now be pushed toward the other end of the

machine to a sufficient distance to bring the sound box into operative relation to the initial end of the record tablet, the full tablet having been previously removed and a new
 5 table substituted, or this may be done after the carriage has been returned to its initial position. In the meantime the record is being produced upon the tablet at the left
 10 hand end of the machine and the carriage there located is moving toward the right. Ultimately this carriage approaches the right hand limit of its travel when the lug
 58 will be brought into engagement with the pin 57 and move the link 56 in a direction
 15 opposite to that in which it was moved by the carriage at the right hand end of the machine at the termination of its travel, and the clutch member 21 will be moved out of engagement with the other clutch member
 20 of the mandrel at the left hand end of the machine and the clutch member 22 will be moved into engagement with the corresponding clutch member of the mandrel at the right hand end of the machine thus starting
 25 the mandrel at the right hand end of the machine into rotation. The pins 50 are at the same time brought into engagement with the respective lugs 48 and the carriage at the right hand end of the machine, previously moved to its initial position, will be caused to travel a short distance with the carriage at the left hand end of the machine, this distance being sufficient to bring the
 30 nut 47 of the carriage at the right hand end of the machine into operative engagement with the threaded portion 19 of the shaft 18. As soon as the second cylinder has received its record and the mandrel carrying it has ceased to move, it may be removed from its
 40 mandrel and another fresh cylinder put in its place ready for an additional record, the carriage and sound box individual to such end of the machine having been moved to its initial position so that when the preceding record is finished the new record may
 45 continue as before. By this means the recording may continue uninterruptedly as long as necessary or desirable.

The machine thus provides means for the
 50 continuous recording of sound without interruption and the reproduction of such records may be caused on the same or a like machine even though the composition recorded covers many tablets of a size convenient to handle.

While the sound conduit for either receiving or amplifying recorded sounds is not shown in the drawing it will be understood that the two necks 31 will have a common
 60 connection to the receiving or the delivery end of a suitable sound conduit as the case may be.

There need be no interruption whatsoever in the continuity of the record as a whole

even though it cover many sound record 65 tablets.

What is claimed is:—

1. In a phonograph, a central feed screw, record tablet holders at opposite ends of the screw, clutches between the screw and re-
 70 spective tablet holders, operating means for the clutches acting to alternately move the clutches into position, sound boxes one for each tablet holder, elongated supports for the sound boxes parallel with the longitudinal
 75 axis of the screw, a feed nut for each sound box movable therewith and pivotally mounted on the respective sound box support, and means under the control of each sound box support for moving the feed nut
 80 of the other sound box into engagement with the feed screw.

2. In a phonograph, a central feed screw, record tablet holders at opposite ends of the screw, clutches between the screw and re-
 85 spective tablet holders, operating means for the clutches acting to alternately move the clutches into operative position, sound boxes one for each tablet holder, elongated supports for the sound boxes movable parallel
 90 with the longitudinal axis of the screw, a feed nut for each sound box support movable therewith and pivotally mounted on the respective sound box support, means under the control of each sound box support for
 95 moving the feed nut of the other sound box support into engagement with the feed screw, and manually operable means for returning either sound box support and its feed nut to initial position without interference
 100 with the other.

3. In a phonograph, a shaft provided with an intermediate screw, record tablet carriers at each end of the shaft, clutches between the shaft and respective tablet carriers, rods
 105 on each side of and parallel with the shaft, a carriage on and movable along the rods adjacent each tablet carrier, a sound box on each carriage, a feed nut on each carriage for engaging with the feed screw, a connection
 110 from each carriage to the other active to cause movement of the inoperative carriage to engagement with the feed screw as the active carriage approaches the limit of its active movement, and clutch-operating
 115 means controlled in turn by each carriage to cause one clutch to engage and the other to disengage.

4. In a phonograph, two parallel spaced carriers, and a carriage adapted to travel
 120 thereon and composed of two rigidly joined supporting members in separated parallel relation mounted on and capable of movement together along the carriers, a sound-box intermediate of said two carriage mem-
 125 bers, a sound conveying tube carried by the sound box and pivotally supported on one of the carriage members at the end remote

from the sound box, and a manipulating member for the sound box pivotally supported on the other carriage member and extending from the latter to the sound box
5 and there pivotally connected to said sound box.

In testimony that I claim the foregoing as

my own, I have hereto affixed my signature in the presence of two witnesses.

ESTEY MURRELL TURNER.

Witnesses:

NEWTON BURKHARDT,
C. M. TURNER.

W. W. YOUNG.
ACOUSTIC DIAPHRAGM.
APPLICATION FILED FEB. 18, 1910.

983,416.

Patented Feb. 7, 1911.

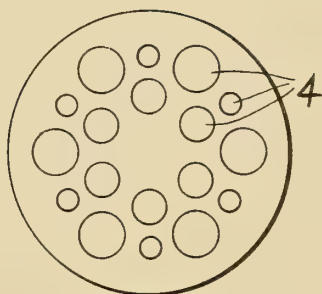


FIG. 1.

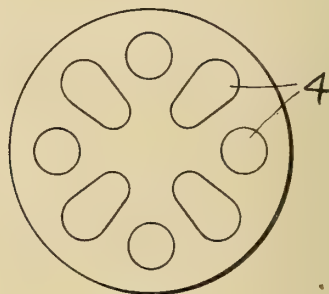


FIG. 2.

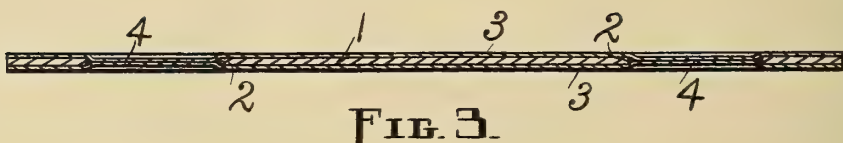


FIG. 3.

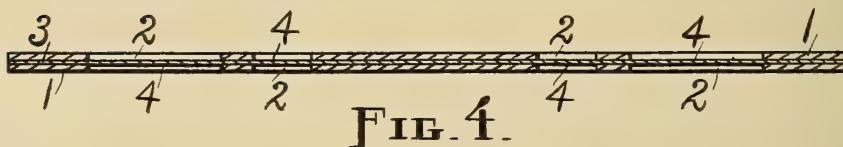


FIG. 4.

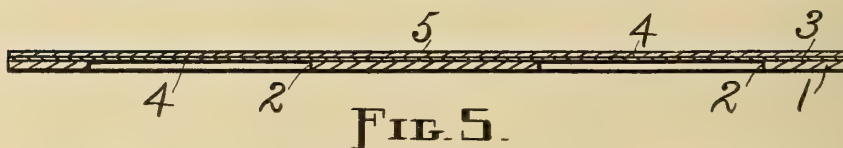


FIG. 5.

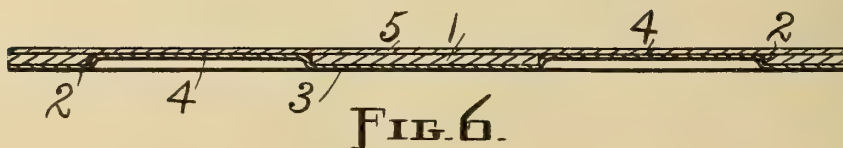


FIG. 6.

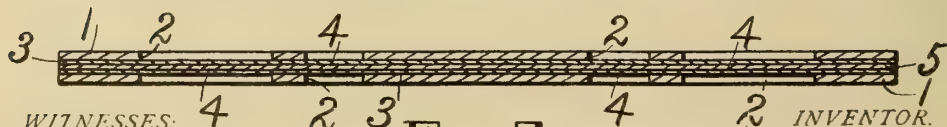


FIG. 7.

WITNESSES:
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William W. Young,
BY
Webster & Co.,
ATTORNEYS.

UNITED STATES PATENT OFFICE.

WILLIAM W. YOUNG, OF SPRINGFIELD, MASSACHUSETTS.

ACOUSTIC DIAPHRAGM.

983,416.

Specification of Letters Patent.

Patented Feb. 7, 1911.

Original application filed January 23, 1909, Serial No. 473,819. Divided and this application filed February 18, 1910. Serial No. 544,659.

To all whom it may concern:

Be it known that I, WILLIAM W. YOUNG, a citizen of the United States of America, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented a new and useful Acoustic Diaphragm, of which the following is a specification, the same being a divisional part of United States application for patent, Serial No. 473,819, filed January 23, 1909.

My invention relates to improvements in acoustic diaphragms for talking machines, telephones, and the like, and consists broadly of a large diaphragm or diaphragm proper provided with one or more lesser diaphragms.

The object of my invention is to produce an acoustic diaphragm, of the class indicated above, which possesses in a marked degree not only the essential but desirable characteristics and qualities of a device of this kind, such as durability and stability, resiliency and resonance, capability of giving out clear, loud and distinct tones of great volume and depth, and of evenly distributing the sound waves and quickly, completely and perfectly recovering its stable equilibrium, and immunity from blasts and scratching sounds and other alien and discordant noises.

In the accompanying drawings, which form part of this application and in which like characters of reference indicate like parts throughout the several views, Figures 1 and 2 are side elevations of two of my diaphragms, showing different formations and arrangements of the lesser or minor diaphragms, and Figs. 3, 4, 5, 6 and 7 are sectional views of five diaphragms, on an enlarged or exaggerated scale, illustrating different combinations or arrangements of the diaphragm-forming elements.

This diaphragm may be made in several different ways, as will presently appear, without, however, departing from the general nature of the invention.

Referring first to Fig. 3, it will be seen that a diaphragm is there represented which consists of a disk 1, of what may be termed the base material which enters into the construction of the diaphragm, in which are a number of perforations 2, and having firmly

attached to both sides thereof two integuments 3. These members constitute the diaphragm proper or major diaphragm, in which are lesser or minor diaphragms 4 consisting of those portions of the integuments 3 which extend across the perforations 2.

Slight modifications of the diaphragm described above appear in the next three views, in which Fig. 4 shows a diaphragm proper which comprises two perforated disks 1 with a single integument 3 between to form the lesser diaphragms 4; Fig. 5 shows a diaphragm proper which comprises a perforated disk 1 and two integuments 3 and 5 of different materials on one side of said disk to form the lesser diaphragms 4; and Fig. 6 shows a diaphragm proper which comprises a perforated disk 1 and two integuments 3 and 5 of different materials on opposite sides of said disk.

That in so far as the merits of my invention are concerned one diaphragm is as good as another and that all are, to all intents and purposes and from a patentable standpoint, substantially alike are self-evident facts.

In Fig. 3 diaphragm the integuments 3 should be pressed into the perforations 2 and into contact with each other, this being done at the time the diaphragm is made, so that in the finished diaphragm the portions of said integuments that are in said perforations and which form the lesser diaphragms 4 will be firmly stuck or cemented together and will therefore be strong and durable. And in the Fig. 6 diaphragm the integument 3 is pressed into the perforations 2, at the time of manufacture, and caused to adhere to those portions of the integument 5 which cover said perforations, as shown.

Various materials for the disk 1 may be employed, among which mention is made of mica, wire gauze, sheet metal, such as aluminum, steel, etc., and fibrous materials such as more or less heavy paper and cardboard or bristol board, blotting paper, and the like. The employment of sheet iron and some other metals renders the diaphragm fit for telephone purposes.

The perforations 2 should be clean-cut holes in the disk 1, and they may be of various shapes and sizes, arranged in any desired

form regular or irregular, and more or less numerous. In the first two views there are shown lesser diaphragms 4 which are outlined by perforations that differ considerably, and from this it is clear that there is almost no limit to the different designs that may be given such perforations both as to outline and arrangement.

The diaphragm in each case is not only coated with a suitable material or combination of materials at the time the integument or integuments are attached thereto and for the purposes of effecting such attachment, but also after the several parts have been thus united, so that the exterior of the finished diaphragm consists of such material or materials. The material or combination of materials used for thus coating the disk or disks 1 and the integument or integuments 3 or 3 and 5 must be of such a nature that the same will adhere firmly to the base material of the diaphragm, that is, the disk or disks, and cause the integument or integuments also to adhere firmly to said base material or to each other, and where integuments are employed on opposite sides of the disk to cause them to stick together in or through the perforations 2; furthermore, the nature of the coating must be such that it will so unite with the other elements and harden during the process of manufacturing the diaphragms as to produce the stable and otherwise excellent device sought for. I have found that a coating which consists of silicate of soda, oxid of zinc, plaster of Paris and barytes, gives most excellent results, the silicate of soda comprising about 95% of the emulsion thus produced, and the other ingredients comprising the other 5% in proportions of about one-third each. This emulsion is applied to the other elements and is pressed and baked thereon, with the result that it cements such elements together and unites with them, even when the base material or one of the integuments or both is or are metal. The diaphragm thus produced possesses the qualities hereinbefore enumerated. I do not intend to confine myself, however, to any particular coating material or materials since the range of materials useful for this purpose is large. In this connection baking japans and varnishes may be mentioned as suitable materials for the coatings.

Tissue paper, silk, linen, and various other thin fabrics are exceedingly well fitted for the integument or integuments 3 out of which may be formed or by means of which may be produced the lesser diaphragms 4. These fabrics take the coating evenly, adhere firmly to the base material, and furnish lesser diaphragms of the right character. For the integument 5, which also may enter into the formation of the lesser dia-

phragms 4, as stated, I prefer to employ very thin metal such as metal foil, because this takes the coating well, and the results obtained therefrom acoustically are of the best, even when the foil is used alone without the fabric, as it may be.

With some metal disks and integuments and the aforesaid emulsion, while the latter does not, of course, enter the metal as it does fiber and fabric to a greater or less extent, nevertheless said emulsion apparently forms a chemical compound with the metal when baked, and probably does—in any event, the acoustic properties of the diaphragm are greatly enhanced by the emulsion coating applied thereto and fixed thereon.

The perforations 2 are made in the disk 1 when said disk consists of wire-gauze just the same as when it consists of material which is imperforate originally.

It is not imperative that two integuments, when that number is used, shall meet or be united in or through the perforations 2, although the structure is stronger when they are so united and it is thought that the desirable acoustic properties of the diaphragm as a whole are increased or improved thereby.

Each of the diaphragms proper or major diaphragms shown in the drawings includes a plurality of lesser or minor diaphragms, 4, but there might be only one minor diaphragm in each case and that one may be of any suitable size and shape.

In addition to the variations already noted herein others may be made in my invention provided the scope of the claim be not exceeded. As examples of such additional variations, I desire to call attention to the following, from which it is obvious that the different combinations or arrangements of the disks and integuments that may be resorted to are quite numerous. The metal foil integument 5 may be substituted for the fabric integument 3 in the Fig. 4 arrangement, or said integument may be introduced into the Fig. 4 arrangement while still retaining said integument 3. In this last example, however, instead of combining only the two integuments 3 and 5, as in Fig. 5, with the second disk 1 added, I may introduce a second integument 3 so that the integument 5 shall be between the two integuments 3 and these three between the two perforated disks. Fig. 7 illustrates the last-mentioned arrangement or combination. Foil integuments 5 may be used in the Fig. 3 arrangement, but they need not necessarily meet in or through the disk perforations.

What I claim as my invention, and desire to secure by Letters Patent, is—

As an improved article of manufacture, an acoustic diaphragm, of the class described, consisting of a plain disk having a plurality of openings therein between the

central portion and the periphery thereof, such openings being so located as to leave intact both the central and edge portions of said disk and also to avoid separating the
5 disk into independent parts, an integument applied to said disk across said openings, and a hardened coating between and on the

outside of said disk and integument, the latter being thinner than the former and forming with said coating lesser diaphragms.

WILLIAM W. YOUNG.

Witnesses:

F. A. CUTTER,

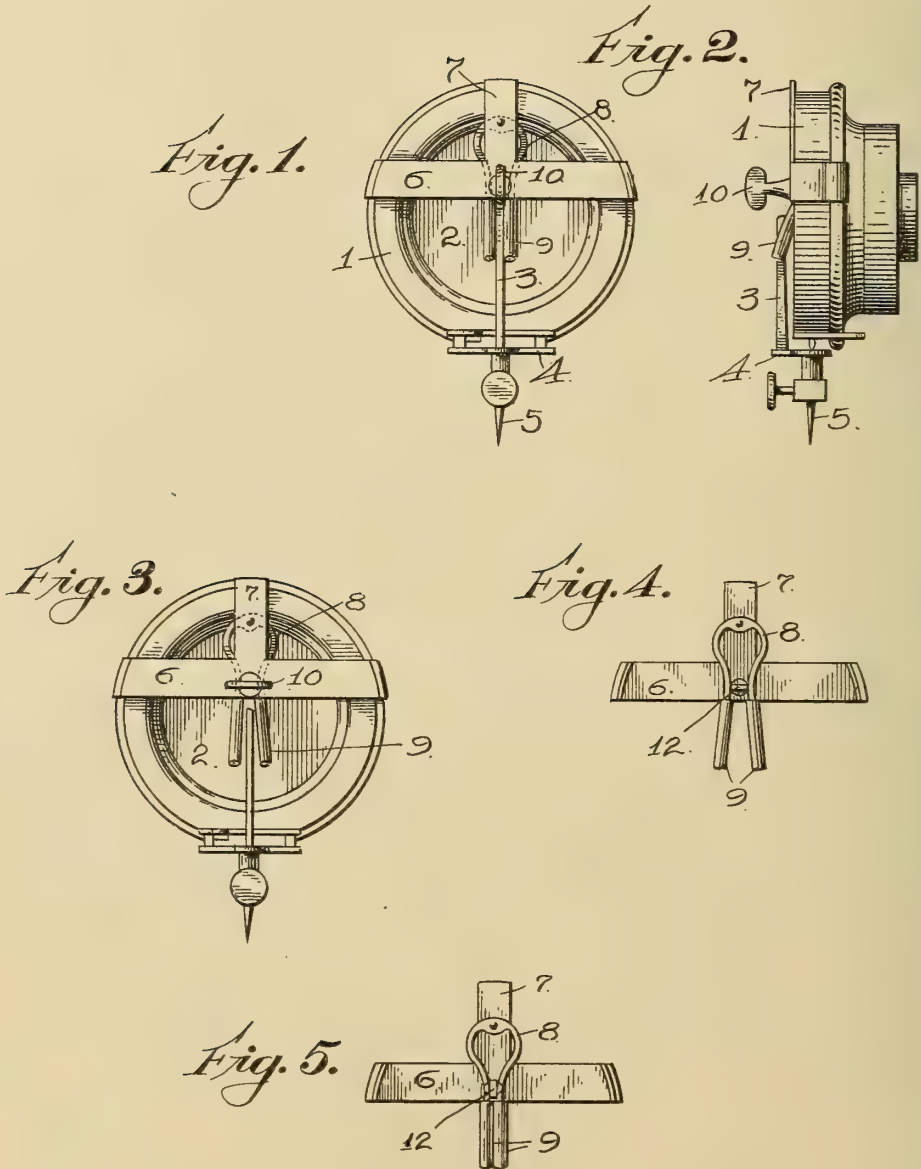
A. C. FAIRBANKS.

983,507

E. McLAREN.
TONE MODIFIER.
APPLICATION FILED JUNE 18, 1910.

983,509.

Patented Feb. 7, 1911.



Witnesses:
Arthur L. Lee.
Arthur White

Inventor:
Edward M. McLaren

UNITED STATES PATENT OFFICE.

EDWARD McLAREN, OF OAKLAND, CALIFORNIA.

TONE-MODIFIER.

983,509.

Specification of Letters Patent.

Patented Feb. 7, 1911.

Application filed June 18, 1910. Serial No. 567,627.

To all whom it may concern:

Be it known that I, EDWARD McLAREN, a citizen of the United States, residing in the city of Oakland, county of Alameda, State of California, have invented a new and useful Improvement in Tone-Modifiers, of which the following is a specification.

My invention relates to tone modifiers for phonographs and has for its object the modification of the reproduced vibrations emanating from the record through the medium of the reproducing needle and its connections with the reproducing diaphragm, the sequence being softer in tone without diminishing the number of reproduced vibrations. I accomplish this by the device illustrated in the drawings appended herewith, in which—

Figure 1 is a front elevation of the "reproducer" of the phonograph, with my device attached and in contact with the vibrator. Fig. 2 is a side elevation of Fig. 1. Fig. 3 is a view similar to Fig. 1, showing the tone modifier attached to the "reproducer" but not in contact with the vibrator. Fig. 4 is a rear view of the modifier detached, with the fingers extended. Fig. 5 is a similar view with the fingers closed.

The numeral 1 is used to designate a hollow metal drum having a circular diaphragm 2, to the approximate center of which is rigidly secured a "vibrator" arm 3 terminating in a balanced contact piece 4, to which is secured the needle 5.

By causing the needle 5 to remain in contact with a revolving "record", the vibration of the record is reproduced through the needle 5, transmitted through the piece 4 and vibrator arm 3 to the diaphragm 2, where the vibrations are greatly intensified by reason of the greatly increased area of the said diaphragm exposed to the atmosphere. Thus far the mechanism is common and is such as is commonly used on all phonographs of the flat disk type.

My invention has to do with the modifications of the vibrations of the vibrator 3. A spider 6 is adapted to engage the periphery of the drum 1 and has secured to its upper arm 7 on the rear side, a bifurcated spring 8, terminating in two fingers 9, said ends being provided with a resilient or vibration absorbing material, preferably rubber. A thumb piece 10 is pivotally secured to the lower portion of the spider 6 extend-

ing through the same and terminating in a shouldered piece 12, which extends between the fingers 9. The piece 12, when lying with its greater width parallel to the fingers 9, allows said fingers to close together and grip the vibrator arm 3. This brings the vibration absorbing material on the fingers 9 to come in contact with the vibrator arm 3 and partially absorb the vibrations which have been reproduced therein. While this does not reduce the rapidity of the vibrations, it tends to reduce their density, thereby producing a softer tone. By making a quarter revolution of the thumb piece 10, the greater dimension of the shouldered piece 12 is brought between the fingers 9, forcing them apart and out of contact with the vibrator 3, allowing the full density of the vibrations as reproduced, to pass to the diaphragm 2. It is obvious that by absorbing a portion of the vibrations, any harshness or mechanical vibrations will be reduced in proportion, giving a softer and more harmonious tone.

The details of construction are so susceptible to variation, that I do not wish to confine myself to the precise construction shown herein, but rather to avail myself of any modification that may fall properly within the scope of my invention.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is—

1. In a tone modifier, for phonographic reproducers, the combination of a frame adapted to engage the reproducer, a bifurcated spring secured to the back of the frame and adapted to engage the vibration transmitter and a shouldered thumb piece interposed between the bifurcations and adapted to separate said bifurcations from contact with the vibration transmitter, for the purpose set forth.

2. In a tone modifier for phonographic reproducers, the combination of a vertical frame having a horizontally disposed bar, whose ends terminate in spring grips, the distance between said grips being slightly less than the diameter of the reproducer, a vertical bar extending upward from the center of the horizontal bar two spring fingers secured to the back of the vertical bar and extending downward, the lower ends of the said fingers being provided with vibration absorbing material, a rectangular plate in-

terposed between the fingers and pivotally
secured to the horizontal bar, said rectangular
piece adapted to separate the fingers
when turned with its greater width perpendicular
5 to the fingers, for the purpose set
forth.

In witness whereof, I hereunto set my sig-

nature in the presence of two subscribing
witnesses.

EDWARD McLAREN.

Witnesses:

ARTHUR L. SLEE,
WALTER E. RODE.

984.767

E. A. ALLWOOD.
 NEEDLE FOR SOUND REPRODUCING INSTRUMENTS.
 APPLICATION FILED JAN. 30, 1909.

984,789.

Patented Feb. 21, 1911.

FIG. 3. FIG. 4. FIG. 5.

FIG. 6.

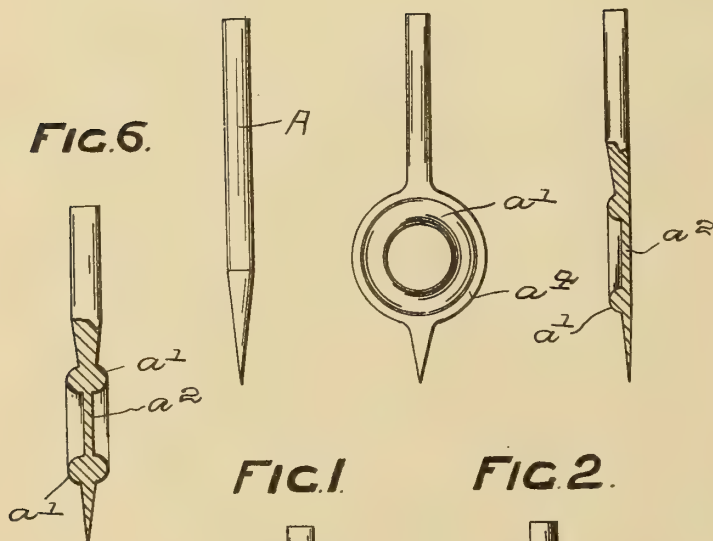
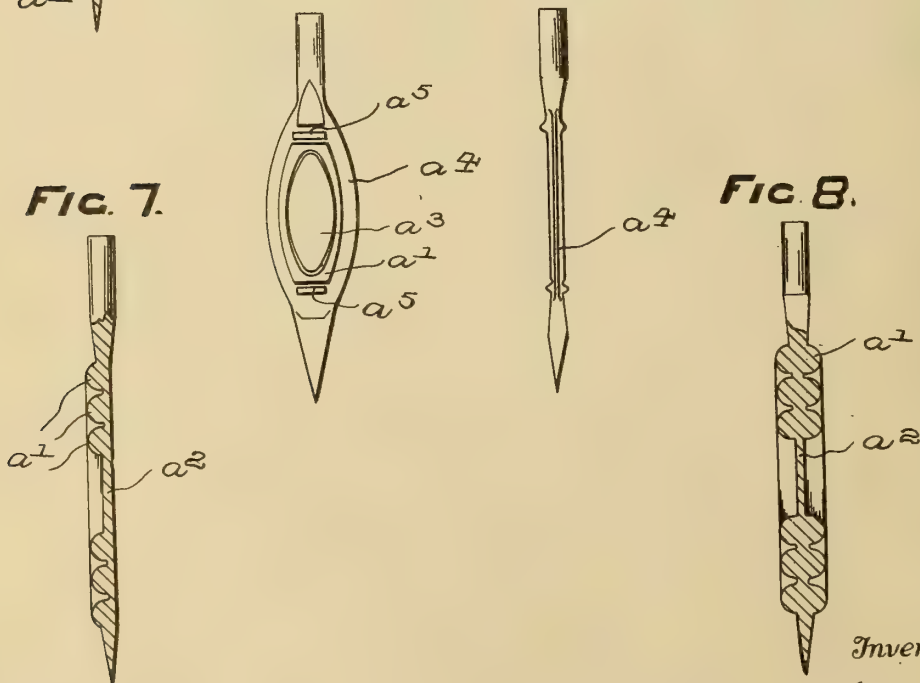


FIG. 1.

FIG. 2.

FIG. 7.



Witnesses

C. E. Smith.
 L. J. Brock.

Inventor,

Ernest A. Allwood
 by C. H. Ricker
 his attorney

UNITED STATES PATENT OFFICE.

ERNEST ALFRED ALLWOOD, OF ALCESTER, ENGLAND..

NEEDLE FOR SOUND-REPRODUCING INSTRUMENTS.

984,789.

Specification of Letters Patent.

Patented Feb. 21, 1911.

Application filed January 30, 1909. Serial No. 475,244.

To all whom it may concern:

Be it known that I, ERNEST ALFRED ALLWOOD, a subject of the Kingdom of Great Britain, residing at Alcester, in the county of Warwick, England, have invented certain new and useful Improvements in Needles for Sound-Reproducing Instruments, of which the following is a specification.

The present invention has relation to needles for use with sound reproducing instruments, and comprises improvements whereby the sound reproducing and vibratory qualities are greatly enhanced.

In order that this invention may be clearly understood and more easily carried into practice, reference may be had to the appended explanatory sheet of drawings on which:—

Figure 1 is a front elevational view of one form of the present invention. Fig. 2 shows a side view of the needle illustrated in Fig. 1. Fig. 3 illustrates a pointed needle previous to stamping. Fig. 4 shows a modified form of needle subsequent to stamping. Fig. 5 is a vertical section of the needle shown in Fig. 4. Figs. 6, 7 and 8 are further modifications of the improved needle.

In carrying the present improvements into effect, the needle is preferably formed from a pointed length of metallic wire A, such wire having one or more raised ridges or rims a' formed by pressing or stamping upon one side of a flattened enlargement as shown by Figs. 5 and 7, or upon both sides

as illustrated in the sectional Figs. 6 and 8, the said ridges or rims being of any suitable section such as semicircular or angular. The metal in the interior of or between the ridges a' is subsequently removed as at a^3 Fig. 1 or in cases in which increased rigidity is required, may be retained in the form of a thin diaphragm a^2 , while a fin or feather a^4 is formed upon the exterior of the rims a' .

The needle may be provided with secondary ridges a^5 across the face in order to supplement the main ridges a' while one ridge or rim may be formed upon one or each side, or multi-ridges as shown in Figs. 7 and 8 may be used.

Having now described my invention, I declare that what I claim is:—

1. A needle for use with sound reproducing instruments having a flattened enlargement with a raised rim or rims thereon, and a fin or feather exterior edge to the said rim or rims substantially as and for the purpose herein set forth.

2. A needle for use with sound reproducing instruments having a flattened enlargement, a centrally depressed diaphragm with a surrounding rim, and a fin to said rim substantially as and for the purpose herein set forth.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

ERNEST ALFRED ALLWOOD.

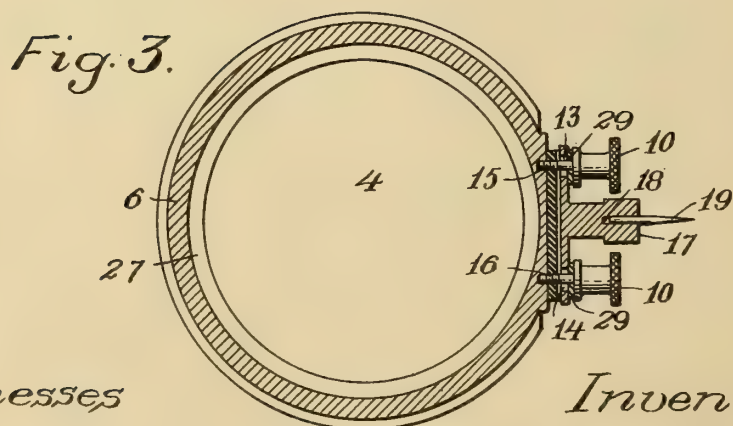
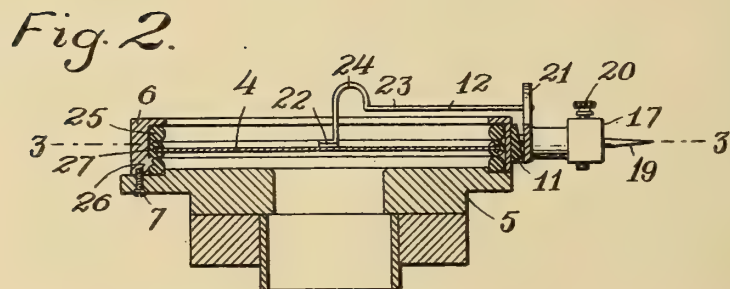
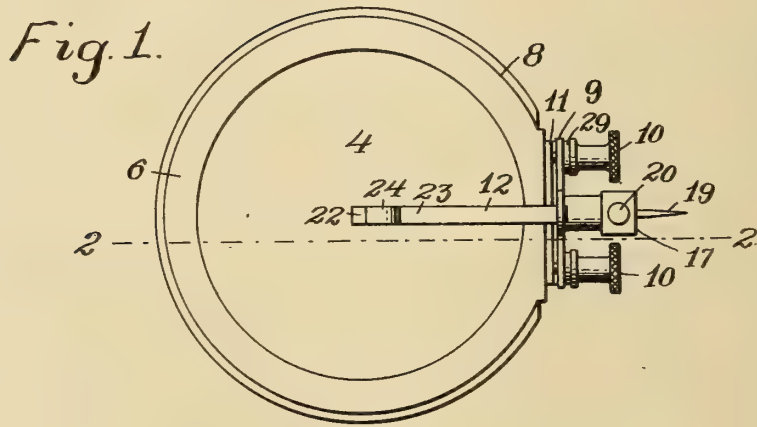
Witnesses:

WALTER H. E. BARTLAM,
HORACE H. SMITH.

H. H. BALLARD.
SOUND REPRODUCING INSTRUMENT.
APPLICATION FILED JULY 6, 1908.

985,496.

Patented Feb. 28, 1911.



Witnesses

R. D. Tolman.

A. H. Nelson.

Inventor

Harlan H. Ballard.

By Harry W. Bartlett
Attorney

UNITED STATES PATENT OFFICE.

HARLAN H. BALLARD, OF PITTSFIELD, MASSACHUSETTS.

SOUND-REPRODUCING INSTRUMENT.

985,496.

Specification of Letters Patent. Patented Feb. 28, 1911.

Application filed July 6, 1908. Serial No. 442,781.

To all whom it may concern:

Be it known that I, HARLAN H. BALLARD, a citizen of the United States, residing at Pittsfield, in the county of Berkshire, State of Massachusetts, have invented a certain new and useful Improvement in Sound-Reproducing Instruments, of which the following is a specification, reference being had therein to the accompanying drawings.

10 This invention relates to improvements in sound reproducing instruments, but more particularly to sound boxes for phonographs, graphophones, and the like. The greatest problem in the construction of these instruments has been to eliminate the metallic sounds caused by the contact of the stylus holder with the metallic portions of the sound box. Heretofore, the bar carrying the stylus holder has generally been supported upon metal projections or lugs upon the rim of the diaphragm holder, and controlled by spring arms also fastened to this rim. This connection of metal parts causes the vibrations of the stylus to be transmitted to the diaphragm holder, and produces the metallic sounds so common to instruments of this type.

15 In the present invention, this metallic contact has been avoided by means of vibration insulation separating the metallic parts.

20 One feature of the invention is the simplicity of construction. In place of spring arms with complicated adjusting screws and locknuts, as has heretofore been used, a cushion of resilient material has been placed between the stylus holding bar and the rim of the diaphragm holder. This allows free vibration of the stylus holder, but does not transmit the vibration to the box, as is the case with the steel springs now used. This bar is preferably fastened to the rim of the diaphragm holder by means of set screws passing through apertures in the bar. These apertures are preferably of a considerably greater diameter than that of the screws to allow free vibration of the bar and prevent metallic contact.

25 Another feature is the form of the cushion mentioned above. This is preferably wedge shaped so that it acts as a means for tilting, or regulating the lever which transmits the vibrations from the stylus holding bar to the diaphragm.

30 Heretofore, the diaphragm has been held between two washers within the diaphragm holder, but constant use has caused it to slide

between these washers and come in contact with the inside walls of the holder. To prevent this, a vibration insulating rim may be placed about the diaphragm, as will be described more fully hereinafter. In the instruments in use at present, the contact point of the vibration transmitting lever has generally been fastened to the center of the diaphragm, as this lever has been constructed of rigid material. This connection is the cause of great inconvenience, as the movement of the lever tears the diaphragm and causes false sounds.

35 A feature of the invention is a resilient lever which does not require fastening to the diaphragm, as it will follow the motions of the latter, and keep constant contact when properly adjusted.

40 Another feature is a resilient tip or contact point upon the lever which transmits to the diaphragm a more even tone than is produced by solid tip.

45 A lever which does not require attachment to the diaphragm allows the use of a great variety of materials in the construction of the latter as great strength is not required. Heretofore, it has been found necessary to use mica for diaphragms, as this was the only material of sufficient resiliency which could at all stand the strain. With the resilient lever or tip, paper, ivory, celluloid, parchment, or a large number of other materials, might be utilized which would give as good, if not better results, at a less cost.

50 It should be clearly understood that the invention is not limited to the construction and arrangement of parts herein described, as they may be materially varied without altering the invention.

55 One embodiment of the invention is shown in the accompanying drawings in which:

Figure 1, is a top view of the sound box complete. Fig. 2, a section on 2-2 of Fig. 1. Fig. 3, a section on 3-3 of Fig. 2, with all parts above the section removed.

60 In the drawings, the diaphragm 1 is held in the sound box 5 by the diaphragm holder 6 which is fastened to the latter by means of screws 7. Upon the rim 8 of the diaphragm holder 6 is fastened the stylus carrying bar 9 by means of the thumb screws 10. Between this bar 9 and the rim 8, is inserted a cushion 11 of rubber, cork or other suitable resilient material. This cushion 11 is preferably wedge shaped with the narrow edge toward the top of the box 5, as is shown in

Fig. 2, and acts as an adjusting means for lever 12, which carries the vibrations from the bar 9 to the face of the diaphragm 4.

The stylus carrying bar 9 is provided with 5 apertures 13 and 14 to allow the thumb screws 10 to pass through them, and mesh in the tapped holes 15 and 16 respectively. These apertures 13 and 14 are preferably 10 cut with their diameter considerably larger than that of the thumb screws 10, so that the latter may not come in contact with the walls of the former. Also these large apertures allow the tilting of the bar 9 to adjust the lever 12, as will be described herein- 15 after.

Upon the bar 9 is the stylus holder 17 having an aperture 18 in which the stylus 19 is seated, the latter being held in place by means of the set screw 20. To the pro- 20 jection or ear 21 on the bar 9, is fastened the lever 12. This lever has a contact point 22 which may be fastened to the diaphragm 4, or may rest upon it. It may be of any suitable construction, but an advantageous 25 type is shown in the drawings in which a shank 23, attached to the ear 21, supports a crook 24, having at its end the contact point 22. The whole is preferably composed of flat watch spring steel or other resilient 30 material, so that the contact point may follow the vibrations of the diaphragm, and also move longitudinally with the shank of the lever. This prevents any tendency of the contact point to damage the diaphragm. 35 The diaphragm is held within the diaphragm holder 6 by the washers 25 and 26, and may be fitted with a washer or rim 27, preferably constructed of vibration-absorption material, about its circumference. This 40 prevents the diaphragm from sliding between the washers 25 and 26, and coming in contact with the metal inner wall of the holder 6.

Between the heads of the thumb screws 45 10 and the top of the bar 9, it is advisable to place small washers 29 of leather, rubber, or other suitable material, so that the latter holds the former more firmly, and prevents the communication of the vibration from the 50 bar 9 to the diaphragm holder.

The method of adjustment of the lever 12 is as follows:—If it is desired to cause the contact point to be pressed more firmly against the diaphragm, the thumb screws 55 10 are advanced, causing the heads 29 to press against the bar 9. As this bar is supported by the wedge shaped cushion 11, a pressure upon the former causes it to tilt forward, as the thick portion of the cushion 60 offers greater resistance than the thin portion. This tilting causes the contact point 22 to be pressed against the diaphragm. If the thumb screws are loosened, the contact point will be withdrawn in the same man- 65 ner. Thus it will be seen that the thumb

screws act as a means of fastening the stylus carrying bar 9 to the diaphragm holder 6, and as an adjusting means for the lever 12.

A resilient tip may be placed upon the contact point 22 of the lever 12. Where a 70 resilient tip or a spring lever is used, it is unnecessary to fasten the lever of the diaphragm, thus allowing greater freedom of action, and causing the instrument to produce sounds which would be too delicate to 75 operate the ordinary type of diaphragm.

What I claim as my invention and desire to secure by Letters Patent is:—

1. In an instrument for producing sound, a sound box, a diaphragm within said sound 80 box, a stylus, a stylus carrier mounted upon the outside of said box, and insulating means between said stylus carrier and said box.

2. In an instrument for producing sound, a sound box, a diaphragm within said box, 85 a stylus carrier movably mounted upon the outside of said box, and an insulating cushion between said stylus carrier and said box.

3. In an instrument for producing sound, a sound box, a diaphragm within said box, 90 a stylus carrier movably mounted upon the outside of said box, and an insulating cushion of resilient material between said stylus carrier and said box.

4. In an instrument for producing sound, 95 a sound box, a diaphragm within said box, a stylus, a stylus carrier, a cushion of resilient material between said stylus carrier and said box, and means for attaching said carrier to said box whereby the carrier shall be 100 free to rock upon the cushion.

5. In an instrument for producing sound, a sound box, a diaphragm within said box, 105 a stylus, a stylus carrier, means for connecting said carrier with said diaphragm, a wedge shaped cushion between said carrier and said box, and means for movably attaching said carrier to said box.

6. In an instrument for producing sound, a sound box, a diaphragm within said box, 110 a stylus, a stylus carrier, a cushion of resilient material between said stylus carrier and said box, and screws passing through apertures in said carrier to attach said carrier to said box. 115

7. In an instrument for producing sound, a sound box, a diaphragm within said box, 120 a stylus, a stylus carrier, a lever carried by said stylus carrier to connect the same with said diaphragm, a cushion of resilient material between said carrier and said box, and adjusting screws passing through apertures in said carrier to fasten the same to said box.

8. In an instrument for producing sound, 125 a sound box, a diaphragm within said box, a stylus, a stylus carrier, a lever carried by said stylus carrier to connect the same with said diaphragm, a cushion of resilient material between said stylus carrier and said 130

box, and screws passing through apertures in said carrier to fasten the same to said box, said apertures being of a greater diameter than the screws to allow the carrier to rock upon the cushion.

9. In an instrument for producing sound, a sound box, a diaphragm within said box, a stylus, a stylus carrier, means for connecting said carrier with said diaphragm, a wedge shaped cushion of resilient material between said carrier and said box, and adjusting screws to fasten said carrier to said box whereby said carrier may rock upon said cushion.

10. In an instrument for producing sound,

a sound box, a diaphragm within said box, a stylus, a stylus carrier, a lever carried by said stylus carrier to connect the same with said diaphragm, a cushion of resilient insulating material between said stylus carrier and said box, and screws passing through apertures in said carrier to fasten the same to said box, said screws being insulated from said carrier.

In testimony whereof I affix my signature in presence of two witnesses.

HARLAN H. BALLARD.

Witnesses:

JEANNETTE E. WATERMAN,
LUCY B. BALLARD.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

985708

P. WEBER.
PHONOGRAPH.

APPLICATION FILED JUNE 5, 1909.

985,716.

Patented Feb. 28, 1911.

Fig. 1

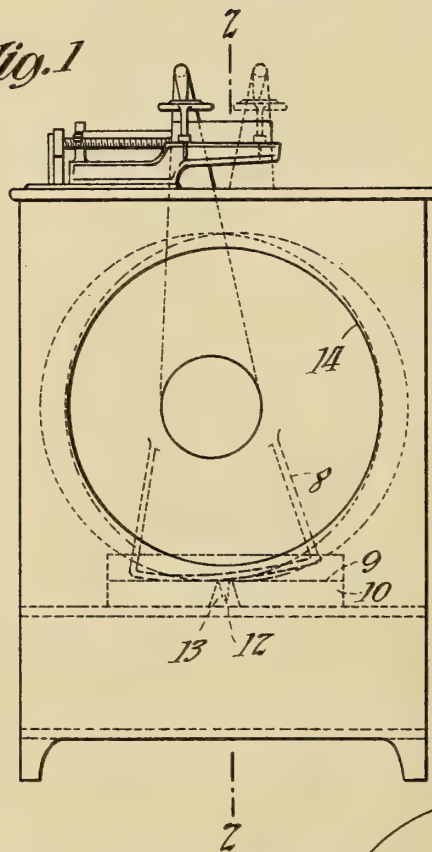


Fig. 2

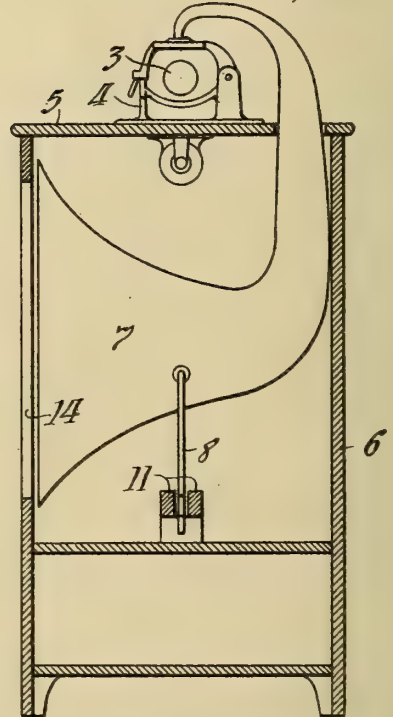
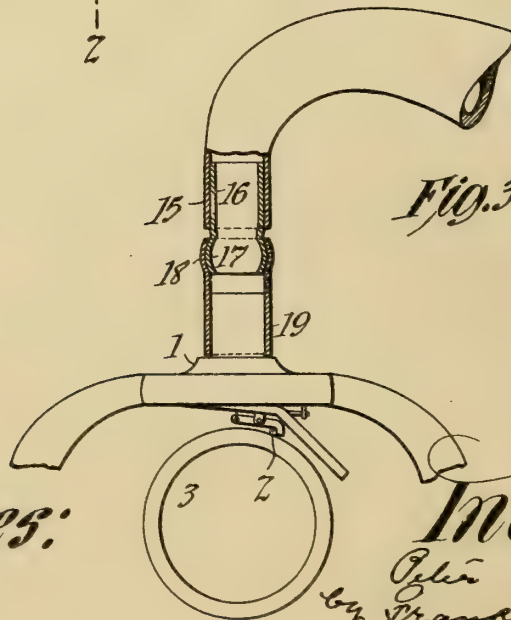


Fig. 3



Witnesses:
James D. Lewis
Dye Smith

Inventor:
Peter Weber
by Frank L. Brown
Att'y.

UNITED STATES PATENT OFFICE.

PETER WEBER, OF ORANGE, NEW JERSEY, ASSIGNOR TO NEW JERSEY PATENT COMPANY, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

PHONOGRAPH.

985,716.

Specification of Letters Patent.

Patented Feb. 28, 1911.

Application filed June 5, 1909. Serial No. 500,398.

To all whom it may concern:

Be it known that I, PETER WEBER, a citizen of the United States, and a resident of Orange, in the county of Essex and State of New Jersey, have made a certain new and useful Improvement in Phonographs, of which the following is a description.

My invention relates to phonographs, and the object thereof is the provision of an improved means for mounting the phonograph horn or sound conveying means, whereby the end thereof connected to the neck of the reproducer on the traveling carriage may be permitted to travel with the said carriage in a horizontal line, while the body of the horn or the mouth thereof swings through a small angle. This result is achieved preferably by the provision of a rocking support for the horn so shaped as to accomplish the result desired.

Other objects reside in the construction of parts and combinations of elements hereinafter described and more particularly pointed out in the appended claims.

Attention is hereby directed to the accompanying drawings, forming part of this specification, in which the same reference characters are used throughout to denote corresponding parts, and in which:-

Figure 1 is a front view of a cabinet having a phonograph mounted thereon and a phonograph horn contained therein so mounted as to embody my invention. Fig. 2 is a cross section on line 2-2 of Fig. 1, the phonograph and horn being shown in elevation, and Fig. 3 is a detail, partly in section, showing the manner of connecting the horn to the reproducer neck.

Referring to the drawings, the reproducer 1 provided with stylus 2, is so mounted that the said stylus may engage the record on the mandrel 3, the latter and the other parts of the phonograph being supported as by uprights 4 on the top 5 of the cabinet or casing 6. The horn 7 is attached at its small end to the neck of the reproducer and extends thence downwardly through the top 5 into the cabinet 6, this section of the horn being preferably tapered. The horn is bent at right angles to this section within the cabinet and forwardly directed to its exit or mouth end, the mouth portion of the horn being preferably bell shaped as shown. The horn 7 has affixed thereto the rocker 8 which is supported by the horizontal surface

9 of the supporting member 10. Guides 11 are provided on either side of the rocker 8 and a lug 12 is provided projecting outwardly from the center of the curved bearing surface of the rocker 8 into the recess 13 in supporting member 10, this recess being in the form of an inverted V, whereby overthrow of the rocker is prevented.

The co-acting surfaces comprising the bottom surface of the rocker and the bearing surface 9 are so shaped that the upper end of the horn in its travel back and forth with the reproducer from the position shown in full lines in Fig. 1 to that shown in dotted lines, does not tend to rise or fall above or below a horizontal line. During this movement, the rocker 8 rocks on surface 9, the mouth of the horn oscillating back and forth between the extreme position shown by dotted lines in Fig. 1 past the opening 14 formed in the front of the cabinet. If desired, opening 14 could be made large enough to extend opposite the mouth of the horn in all the positions of the latter, or if made of approximately the same diameter as the mouth of the horn, as shown, guiding means could be employed for smoothly guiding to the opening 14 sounds issuing from the periphery of the horn opposite the closed portion of the front of the cabinet when the horn is in its extreme positions.

The horn 7 is connected to the reproducer 1 by means preferably of a telescoping and a universal joint connection. The horn 7 at its upper end is formed into a cylindrical tube portion 15 within which is slidably mounted the tube 16 formed at its lower end beyond the end of tube 15 with the ball 17, which is mounted to provide universal motion within the socket 18 of the tube 19, which is directly connected with the reproducer 1. By means of the telescoping connection, the reproducer may be lifted from the record in order to change the same, and by means of the universal connection provided, the swinging of the lower end of the horn while the upper end travels in a straight line, is allowed for.

It is obvious that various changes may be made in my invention without departing from the spirit thereof, and accordingly, I wish it to be understood that my invention is limited only by the terms of the appended claims.

Having now described my invention, what

I claim and desire to protect by Letters Patent is as follows:

1. In a phonograph, the combination of an amplifying horn, a rocking support for the same, and a supporting means having a plane surface upon which said rocking support rests, substantially as described.

2. In a phonograph, the combination of an amplifying horn, a supporting means secured to the same having a curved bearing surface, and a support having a coacting bearing surface upon which said curved surface is rockably supported, substantially as described.

3. In a phonograph, the combination of a casing, a reproducer having a traveling carriage mounted upon the top thereof, an amplifying horn connected to the neck of the reproducer and extending within the casing, said casing having an opening opposite the mouth of the horn, and a rocking support for the horn within the casing, substantially as described.

4. In a phonograph, the combination of an amplifying horn having a forwardly extending bell, a rocker attached to said bell and extending in a plane parallel to the mouth of the horn, and a support having a plane surface upon which said rocker rests.

5. In a phonograph, the combination of a reproducer having a traveling carriage, a horn connected to the neck of the reproducer and extending downwardly and forwardly from such connection to its mouth, and means for supporting said horn so that the end thereof connected to the reproducer neck moves in a straight horizontal line with the traveling carriage while the mouth thereof swings in an arc in a plane parallel to the path of the reproducer, substantially as described.

6. In a phonograph, the combination of a reproducer having a traveling carriage, a horn connected to the neck of the reproducer and extending downwardly and forwardly from such connection to its mouth, a rocker secured to said horn and a support upon which said rocker rests, the co-acting surfaces of the rocker and support being so

formed that in the rocking movement of the horn the upper end thereof moves in a substantially straight line, substantially as described.

7. In a phonograph, the combination of an amplifying horn, a rocker secured thereto and a support upon which said rocker rests, the rocker being so placed in relation to the horn that the latter will be substantially in equilibrium in any rocking position, substantially as described.

8. In a phonograph, the combination of an amplifying horn, a rocker secured thereto and a support upon which said rocker rests, provided with guides for said rocker, and means for preventing overthrow of said rocker, substantially as described.

9. In a phonograph, the combination of a reproducer having a traveling carriage, a horn connected to the neck of the reproducer, and means for supporting said horn so that the end thereof connected to the reproducer neck moves in a straight horizontal line with the carriage while the mouth thereof swings in an arc in a plane parallel to the path of the reproducer, substantially as described.

10. In a phonograph, the combination of a reproducer having a traveling carriage, a horn connected to the neck of the reproducer by a universal joint, and means for supporting said horn so that the end thereof connected to the reproducer neck moves in a straight horizontal line with the carriage while the mouth thereof swings in an arc in a plane parallel to the path of the reproducer, substantially as described.

11. In a phonograph, the combination of a reproducer having a traveling carriage, a horn connected to the neck of the reproducer by a universal joint, and a telescoping connection, a rocker secured to the horn, and a support having a surface upon which said rocker rests, substantially as described.

This specification signed and witnessed this 4th day of June 1909.

PETER WEBER.

Witnesses:

CHAS. J. WETZEL,
DYER SMITH.

985124

F. L. DYER.
 PHONOGRAPH REPRODUCER.
 APPLICATION FILED MAR. 18, 1909.

985,736.

Patented Feb. 28, 1911.

Fig. 1

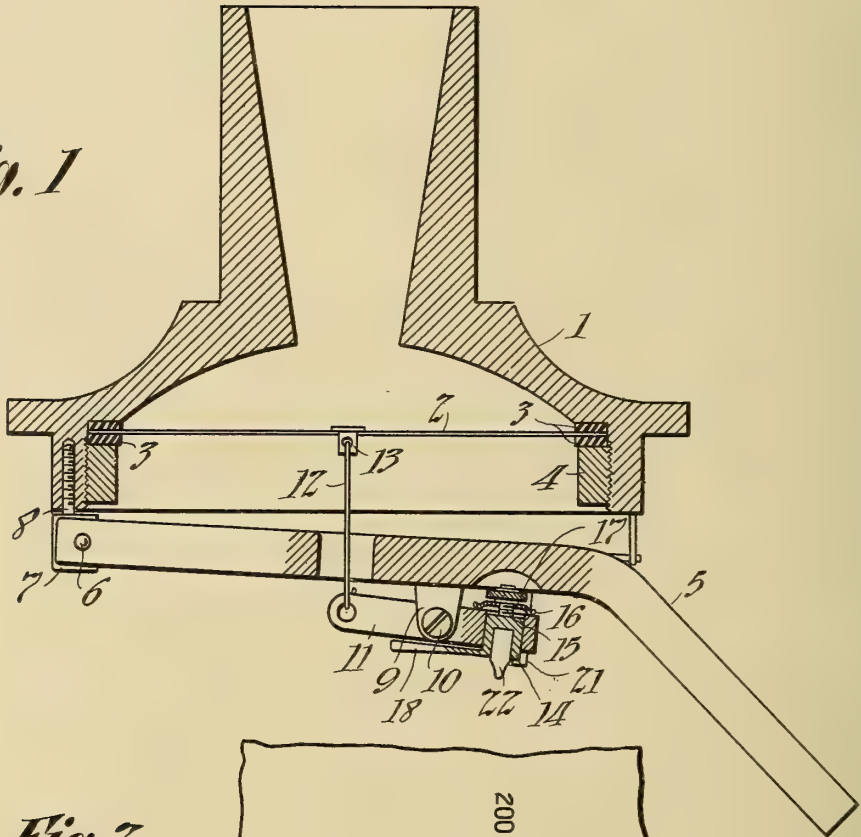
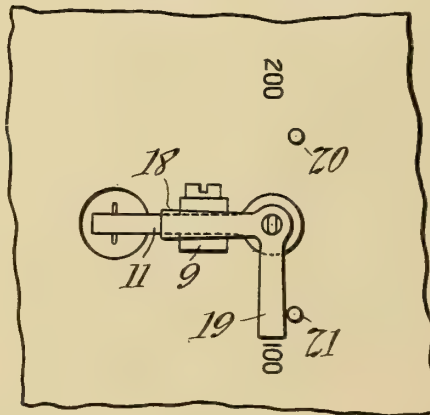


Fig. 2



Witnesses:
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Inventor:
 Frank L. Dyer

UNITED STATES PATENT OFFICE.

FRANK L. DYER, OF UPPER MONTCLAIR, NEW JERSEY, ASSIGNOR TO NEW JERSEY PATENT COMPANY, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

PHONOGRAPH-REPRODUCER.

985,736.

Specification of Letters Patent.

Patented Feb. 28, 1911.

Application filed March 18, 1909. Serial No. 484,298.

To all whom it may concern:

Be it known that I, FRANK L. DYER, a citizen of the United States, and a resident of Upper Montclair, county of Essex, and State of New Jersey, have made a certain new and useful Invention in Phonograph-Reproducers, of which the following is a specification.

My invention relates to phonograph reproducers and the object thereof is particularly to improve the construction described and claimed in the application of Louis A. Chipot, Serial No. 474,843, for phonograph reproducer styluses, filed January 28, 1909. In the application of said Chipot, a phonograph stylus is provided, which is formed with different contours in planes at right angles to each other, or at some different angle to each other, so that the stylus as viewed in one direction is narrower than when viewed in the other direction. The cross section of the stylus in one direction is of suitable size and form for tracking a record groove having certain characteristics, and its cross section in the other direction is of suitable size and form for tracking a record groove having different characteristics. The stylus was designed particularly for use in tracking record grooves having respectively 200 threads to the inch and 100 threads to the inch, although, of course, it is obvious that it might be used in connection with record grooves having different pitches or different characteristics by modifying the contours of the stylus above referred to. This stylus was mounted by the said Chipot in any suitable manner so that it could be shifted readily through an angle of 90 degrees, or through whatever angle was requisite to permit the stylus to be used for tracking the two records of different characteristics above referred to. The stylus was thus adapted to be used in a single reproducer comprising a diaphragm, sound box, floating weight, and a single stylus lever, upon one end of which is preferably mounted a holder for the stylus. In this preferred form, the holder is rotatably mounted upon the lever, so that by rotation of the holder, either contour may be presented in position for tracking the desired record. In my improvement upon this construction, I provide arms or projections upon the said holder, which can be easily manipulated to rotate the holder, and stops or projections upon a relatively

fixed member, as the floating weight, adapted to co-act with the arms upon the stylus holder in order to limit the movements of the holder and properly position the stylus for tracking the different records. I also preferably provide indicating means to designate the particular record with which the stylus is in position to co-act when one of the arms above described is in contact with its appropriate stop.

In order that the invention may be more fully understood, reference is made to the accompanying drawing in which—

Figure 1 is a side elevation, partly in section, of a phonograph reproducer constructed in accordance with my invention, and Fig. 2 is a bottom plan view showing the stylus lever, stylus holder and stylus, together with the arms upon or integral with the stylus holder, the stops upon the floating weight co-acting therewith, and the indicating means.

The reproducer shown in Fig. 1 comprises a sound box body 1 of the usual form, and the diaphragm 2 secured between gaskets 3 by a clamping ring 4 threaded in said body. The floating weight 5 is pivoted at 6 to the pivot block 7, which is pivoted to the body 1 by the usual screw 8, and the floating weight carries the depending lugs 9, in which is mounted the horizontal screw or stud 10 on which the stylus lever 11 is pivoted. One end of said lever is connected to the center of the diaphragm 2 by the usual link 12 and head 13. The stylus holder 14 is pivotally connected to the end of the stylus lever distant from the link 12 in any suitable manner. In the construction shown, the stylus holder is rotatably mounted within a recess or passageway in the stylus lever 11 in which it closely fits, the stylus holder 14 having integrally formed therewith as an extension thereof the screw 15. The spring member or resilient washer 16 is slipped over this threaded stud 15 when the stylus holder is in position in its recess in the stylus lever, when the nut 17 is screwed down on the screw 15, pressing upon the spring member 16, the holder 14 thus being securely held in position. It is, of course, obvious that the holder 14 might be mounted in the lever 11 in any other suitable manner, as by forming the holder 14 with a peripheral thread which is adapted to engage a screw thread on the bore of the opening.

Preferably, the holder has formed integrally therewith two arms 18 and 19, which, in the case of a stylus having its two distinctive contours in planes at 90 degrees apart from each other, would preferably be mounted at an angle of 90 degrees apart. These two arms are adapted to co-act with the stops or lugs 20 and 21, which project from the lower surface of the floating weight. Adjacent to the stops 20 and 21, suitable indicia may be marked, as the figures 200 and 100 shown in Fig. 2 of the drawings, which indicate that when the arm 19 is in contact with the stop 21, the stylus is positioned to track a record having 100 threads to the inch, and when the arm 18 is in contact with the stop 20 that the stylus has been turned so that it is in position to track a record having 200 threads to the inch. It is, of course, obvious that the arms 18 and 19 might be located at different angles, and that the stops 20 and 21 might be differently situated, if the relation between the two contours of the stylus and the position thereof when the arms are in contact with their stops, is observed. It is, of course, also obvious that but a single arm might be used if the two stops were so positioned as to co-act therewith to properly position the stylus for tracking the two types of records. With the construction shown, the arms 18 and 19

form convenient means for easy manipulation by the operator. The stylus 22 may be of any suitable material such as sapphire, and is cemented or otherwise secured in a socket formed in the holder 14.

Having now described my invention, what I claim and desire to secure by Letters Patent is as follows:

In a phonograph reproducer, in combination, a stylus lever, a stylus holder carried by said lever, a floating weight on which the stylus lever is mounted, said holder having a pair of arms mounted ninety degrees apart movable therewith, and stops on said floating weight one hundred and eighty degrees apart adapted to co-act with said arms to limit the movement of the holder in either direction, and a stylus carried by said holder and having different contours in planes at an angle of ninety degrees from each other, either contour being in position to track a certain type of record groove when the appropriate arm is in contact with its co-acting stop, substantially as described.

This specification signed and witnessed this 16th day of March, 1909.

FRANK L. DYER.

Witnesses:

DYER SMITH,
JOHN M. CANFIELD.

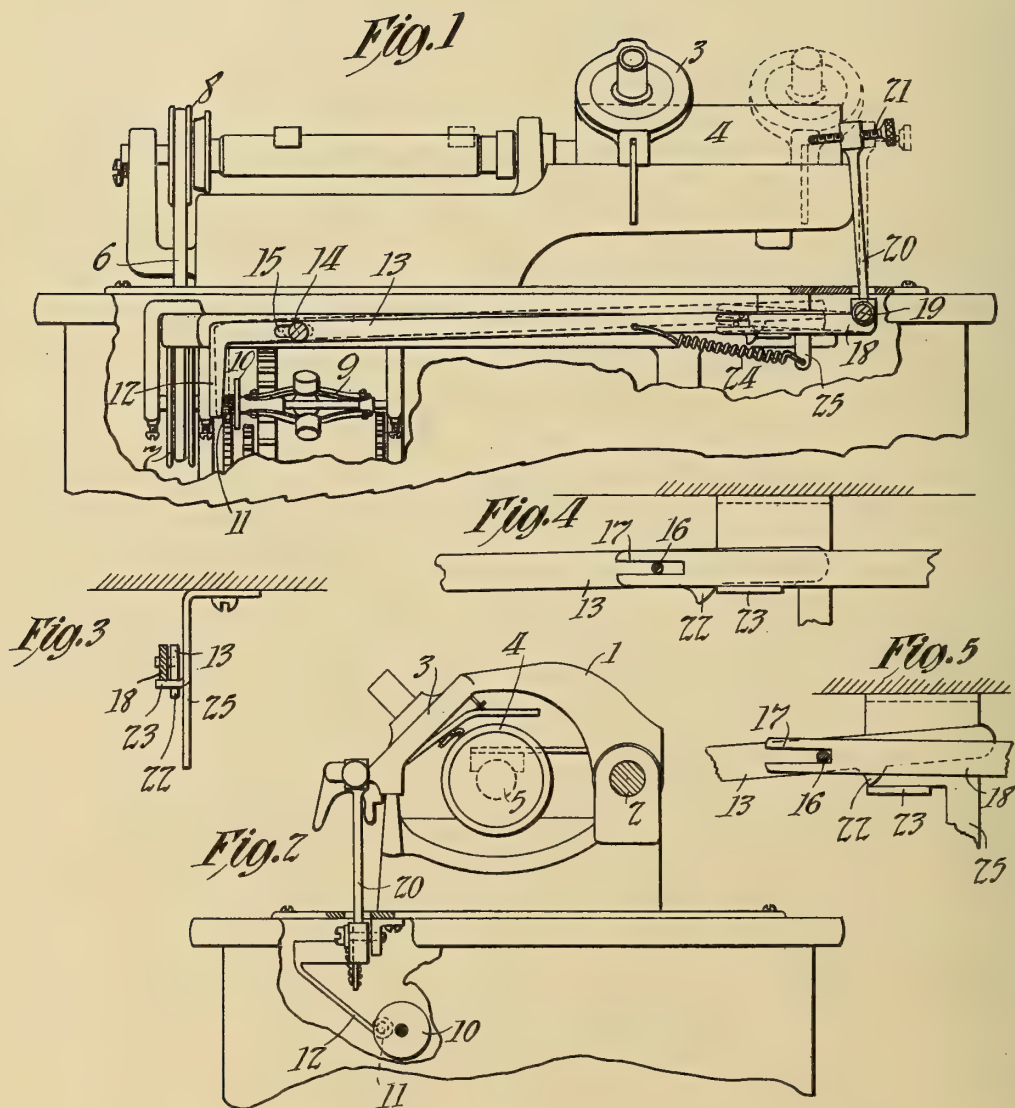
Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

985,117

P. WEBER.
 PHONOGRAPH STOP DEVICE.
 APPLICATION FILED JUNE 5, 1909.

985,717.

Patented Feb. 28, 1911.



Witnesses:
 Sigmond B. Crossley
 Dyer Smith

Inventor:
 Peter Weber
 by Frank T. Wynn
 Atty.

UNITED STATES PATENT OFFICE.

PETER WEBER, OF ORANGE, NEW JERSEY, ASSIGNOR TO NEW JERSEY PATENT COMPANY, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

PHONOGRAPH STOP DEVICE.

985,717.

Specification of Letters Patent.

Patented Feb. 28, 1911.

Application filed June 5, 1909. Serial No. 500,400.

To all whom it may concern:

Be it known that I, PETER WEBER, a citizen of the United States, and a resident of Orange, in the county of Essex and State of New Jersey, have made a certain new and useful Invention in Phonograph Stop Devices, of which the following is a description.

My invention relates to phonograph stop devices and the object thereof is to provide a simple, novel and efficient means for stopping the motor of the machine automatically when the reproducer reaches the end of the record or any other desired predetermined point.

Other objects of my invention reside in the construction of parts and combinations of elements hereinafter described in the following specification and particularly pointed out in the appended claims.

Attention is hereby directed to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a front elevation of a phonograph provided with my invention, the front of the cabinet of the machine being shown as partly broken away to show the inclosed parts. Fig. 2 is an end view looking from the left in Fig. 1. Fig. 3 is a detail of construction, and Figs. 4 and 5 are details showing the positions of the link connections and detent means when the machine is in "on" and "off" positions respectively.

Referring to the drawings, the traveling carriage 1 is slidably mounted on back rod 2, the carriage carrying reproducer 3, which carries the well known floating weight, stylus lever mounted thereon, and stylus carried thereby, in engagement with the record 4 on the mandrel 5. The machine is operated in the well known manner by the belt 6 passing over belt wheel 7, which is rotated by a motor, the belt passing over belt wheel 8 from which the phonograph mandrel and the feed screw are rotated.

The motor of the phonograph is provided with a governor 9, which has the usual governor disk 10, with which is adapted to co-act the friction pad 11 of felt or other convenient material. This pad 11 is carried at the end of a downwardly extending arm 12 of a link 13 which extends in an approximately horizontal position and is supported at its left end, as shown in Fig. 1, by the

pin 14, which extends through the slot 15 in the link 13. At its right end the link 13 is provided with a pin 16 which rests slidably within slot 17 formed in the left hand end of bell crank 18, which is pivotally supported at 19 and provided with an upwardly directed arm 20 which extends through an opening in the top of the casing of the phonograph and has a head at its upper end through which extends the screw 21, the end of which is adapted to be contacted by the traveling carriage at the point at which it is desired to stop the machine, which point may be changed by advancing or retracting the screw 21 of the member 20.

The link 13 is provided with a cam-shaped projection 22 extending downwardly from the lower side thereof, this projection 22 co-acting with the stop 23 to hold the link 13 in its "off" position, or that position in which friction pad 11 is out of contact with governor disk 10. Link 13 has attached thereto the spiral spring 24, the other end of which is secured to the stationary member 25, whereby a constant tendency is exerted on link 13 to move to the right, as indicated in Fig. 1, and apply the brake by the contact of pad 11 on disk 10. This movement is prevented by the contact of projection 22 with stop 23, but the moment that the traveling carriage of the phonograph contacts the end of screw 21, the left hand end of bell crank 18 provided with slot 17 is raised, the right hand end of link 13 being raised therewith because of the co-action of pin 16 carried by link 13 and the slot 17 in the bell crank 18. With a slight upward movement of pin 16, cam projection 22 rides up over the top of stop 23, the spring 24 aiding in the movement, link 13 swinging about pin 14 as a pivot, and at the same time sliding in the direction of its length across the said pin and applying the pad 11 to disk 10 to stop the motor. When it is desired to again start the machine, the arm 20 of the bell crank 18 is simply given a slight push to the left from the dotted to the full line position shown in Fig. 1, whereby cam projection 22 rides down over the edge of stop 23 into its latched position, spring 24 being again put under tension and pad 11 removed from contact with disk 10.

Having now described my invention, what

I claim and desire to protect by Letters Patent is as follows:

1. In a phonograph, the combination with the governor disk of a member carrying a friction pad adapted to co-act with said disk to control the same, and carrying a cam projection, means tending to move said pad into contact with said disk, an abutment co-acting with said projection to hold said pad out of contact with said disk, and a bell crank for lifting the end of said member to allow the cam projection to ride over said abutment, substantially as described.

2. In a phonograph, the combination with the governor disk of a member carrying a friction pad adapted to co-act with said disk to control the same, and carrying a cam projection, means tending to move said pad into contact with said disk, an abutment co-acting with said projection to hold said pad out of contact with said disk, a pin carried by said member, a member having a slot in which said pin is slidably supported, and means for raising the slotted end of said last named member to lift the end of said first named member to allow the said cam projection to ride over said abutment, substantially as described.

3. In a phonograph, the combination with the governor disk of a member carrying a friction pad adapted to co-act with said disk to control the same, and carrying a projection, means acting on said member tending to move said pad into contact with said disk, an abutment coacting with said projection to hold said pad out of contact with said disk, means slidably supporting said member at one end, means supporting

said member at the other end, and means for lifting said last named means to swing said member pivotally about said first named supporting means and free said projection from said abutment, substantially as described.

4. In a phonograph, the combination with the governor disk of a member carrying a friction pad adapted to co-act with said disk to control the same, said member being provided with an elongated slot at one end, a pin extending through said slot for slidably supporting said member, a pin mounted at the other end of said member, a bell crank provided with a slot in which said last named pin rests, an abutment co-acting with a cam projection on said member, a spring acting on said member and tending to apply said pad to said disk, and a traveling member adapted to contact an arm of said bell crank to lift said projection free of said abutment, substantially as described.

5. In a phonograph, the combination with a slidable brake-applying member pivoted and slidable with respect to its pivot, of means tending to slide the said member with respect to its pivot to apply the brake, detent means for the member, and means for moving the member pivotally to unlatch the same and permit it to so slide, substantially as described.

This specification signed and witnessed this 4th day of June 1909.

PETER WEBER.

Witnesses:

CHAS. J. WETZEL,
DYER SMITH.

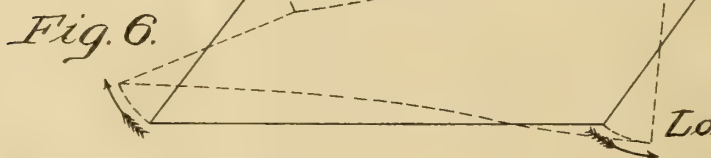
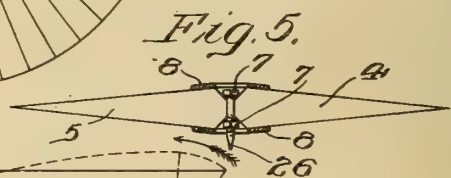
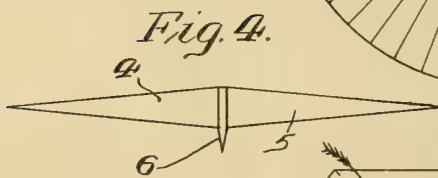
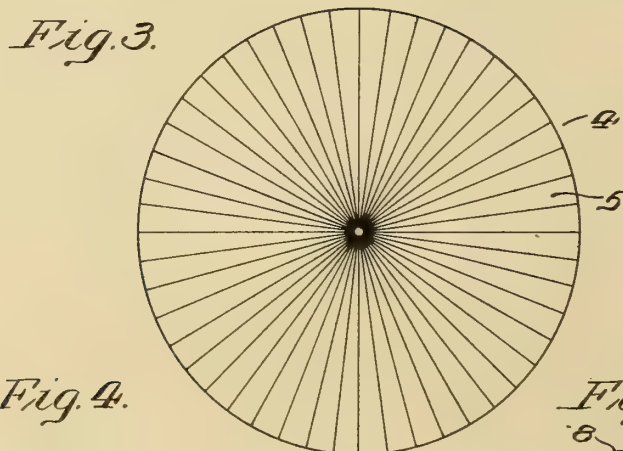
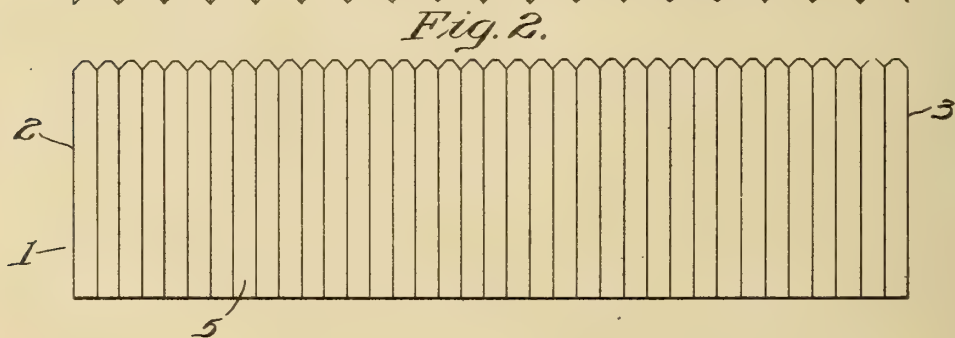
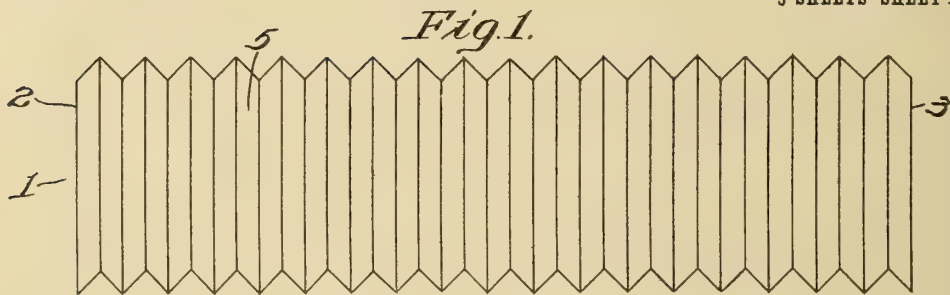
976,427

L. LUMIERE.
ACOUSTICAL INSTRUMENT.
APPLICATION FILED JUNE 30, 1909.

986,477.

Patented Mar. 14, 1911.

5 SHEETS—SHEET 1.



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Alexander B. Moulton

BY

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L. LUMIERE.
ACOUSTICAL INSTRUMENT.
APPLICATION FILED JUNE 30, 1909.

986,477.

Patented Mar. 14, 1911.
5 SHEETS—SHEET 2.

Fig. 7.

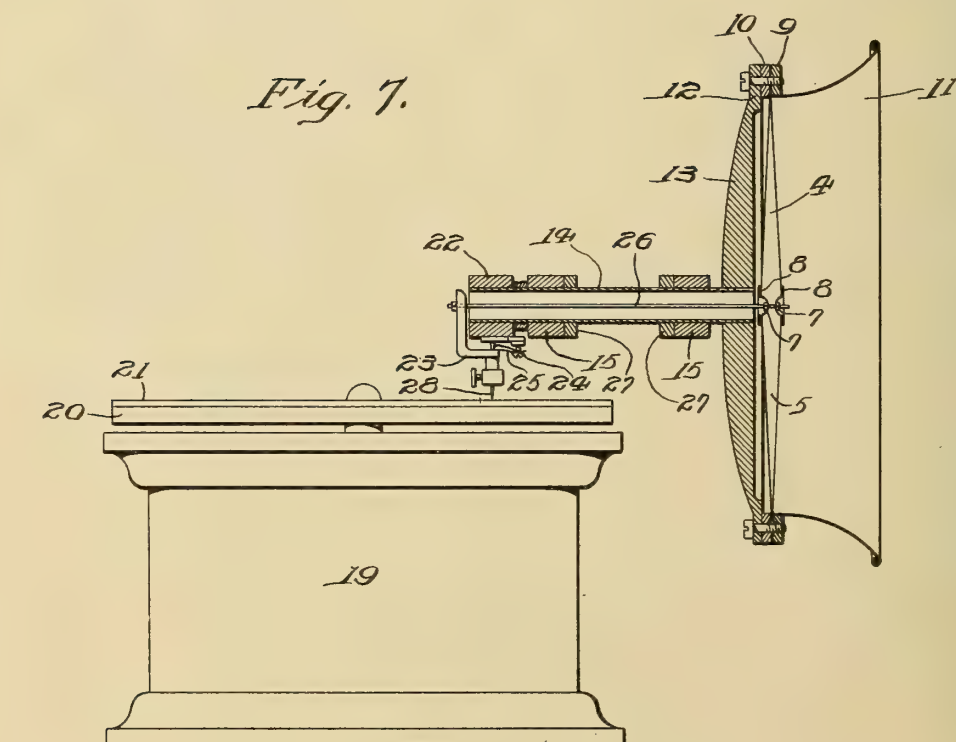
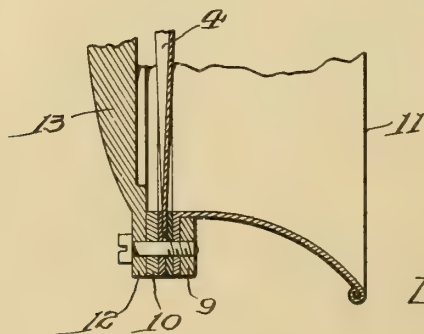


Fig. 7.^a



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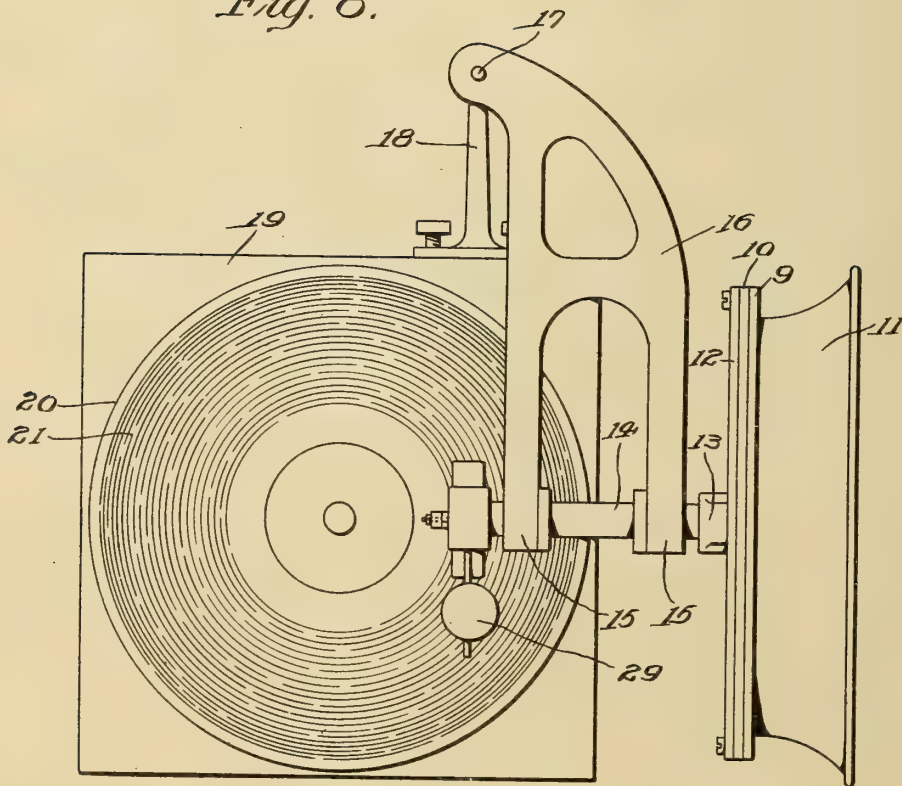
L. LUMIERE.
ACOUSTICAL INSTRUMENT.
APPLICATION FILED JUNE 30, 1909.

986,477.

Patented Mar. 14, 1911.

5 SHEETS—SHEET 3.

Fig. 8.



WITNESSES

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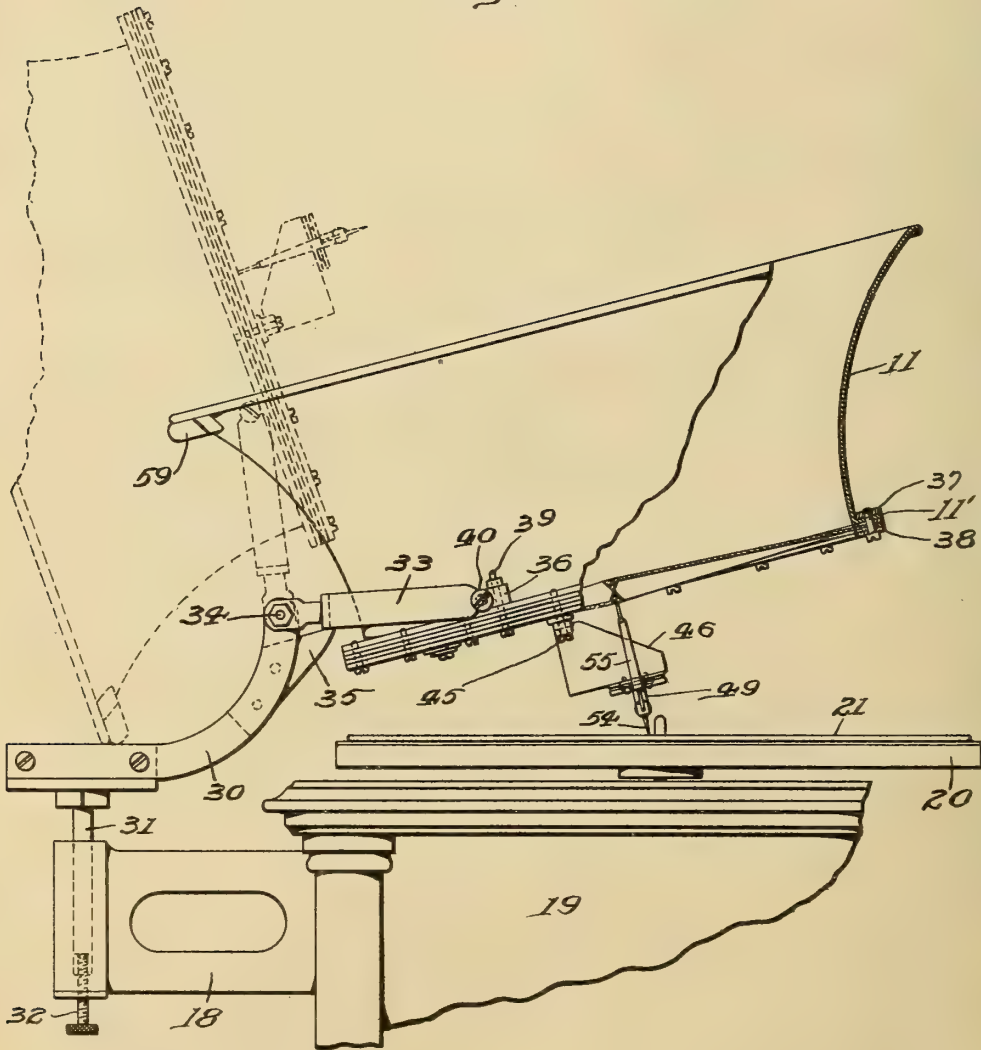
L. LUMIERE.
ACOUSTICAL INSTRUMENT.
APPLICATION FILED JUNE 30, 1909.

986,477.

Patented Mar. 14, 1911.

5 SHEETS—SHEET 4.

Fig. 9.



INVENTOR

Louis Lumiere

WITNESSES

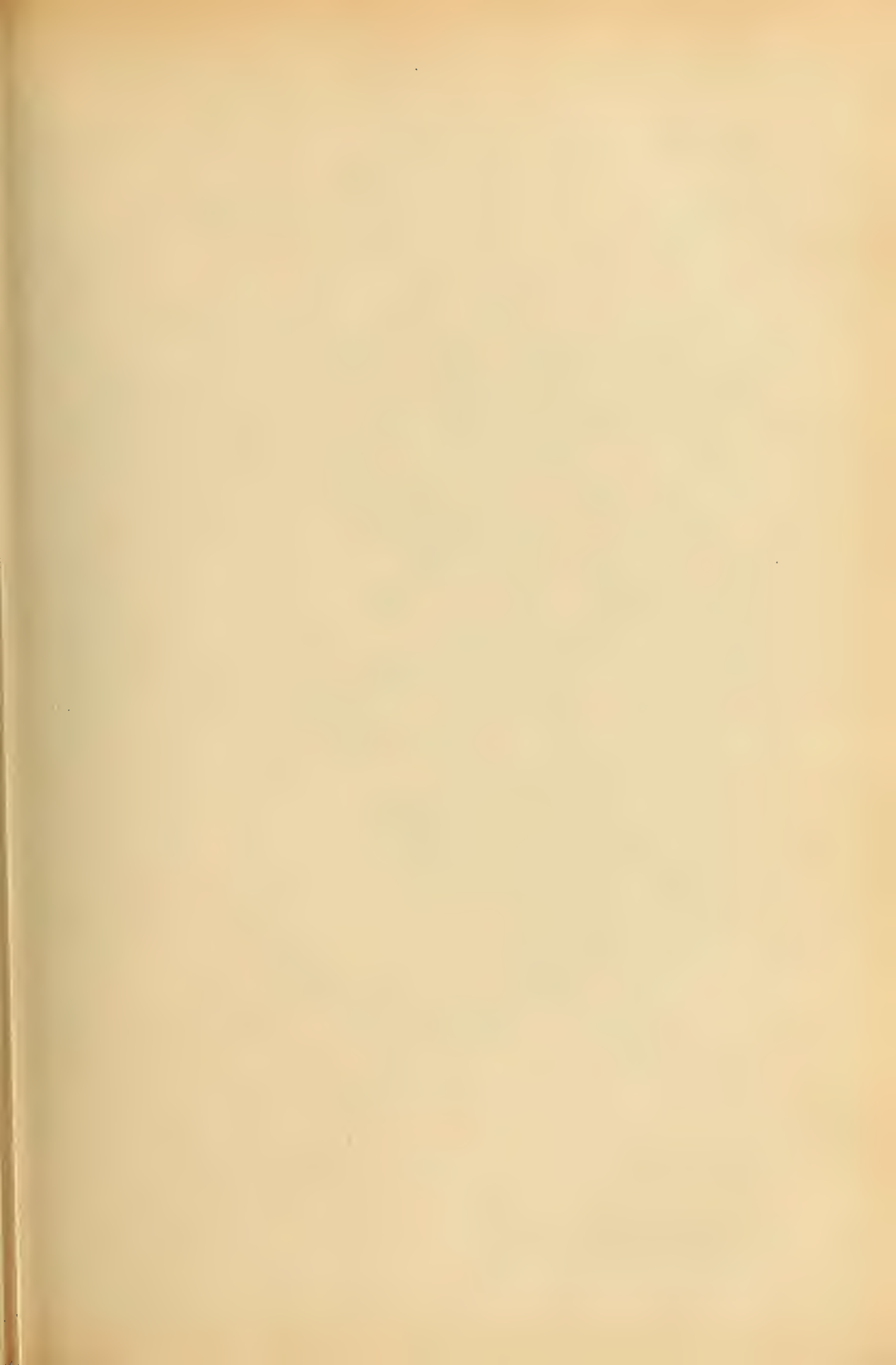
H. J. Hartmann.

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Horace Peters.

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L. LUMIERE.
ACOUSTICAL INSTRUMENT.
APPLICATION FILED JUNE 30, 1909.

986,477.

Patented Mar. 14, 1911.

5 SHEETS—SHEET 5.

Fig. 10.

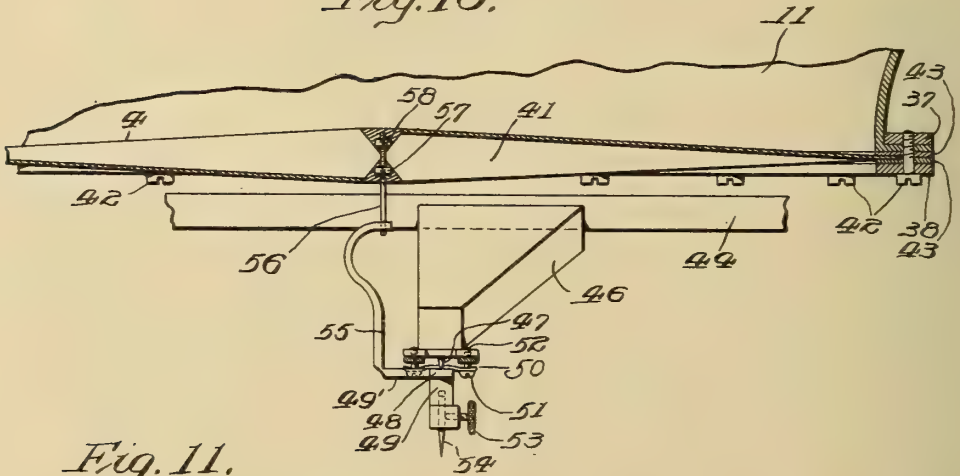
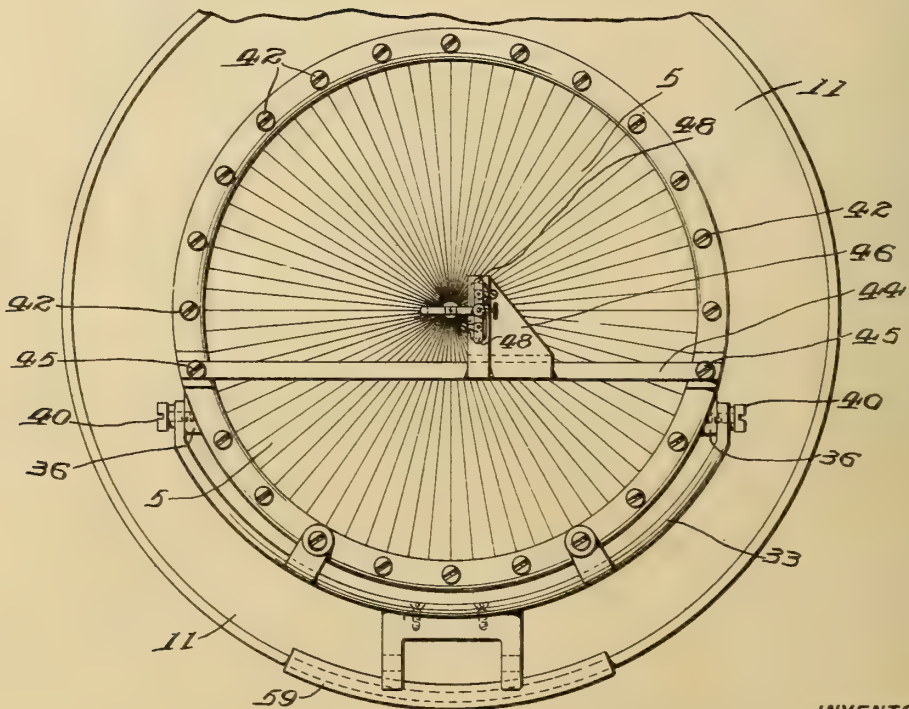


Fig. 11.



INVENTOR

Louis Lumiere.

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UNITED STATES PATENT OFFICE.

LOUIS LUMIERE, OF LYON, FRANCE.

ACOUSTICAL INSTRUMENT.

986,477.

Specification of Letters Patent.

Patented Mar. 14, 1911.

Application filed June 30, 1909. Serial No. 505,149.

To all whom it may concern:

Be it known that I, LOUIS LUMIERE, a citizen of the Republic of France, residing at Lyon, in the Republic of France, have invented certain new and useful Improvements in Acoustical Instruments, of which the following is a full, clear, and complete disclosure.

This invention relates to improvements in acoustical instruments, such as telephones, microphones, sound recording and reproducing machines, and musical instruments in general. As applied to sound recording and reproducing apparatus, it relates more particularly to that part of the instrument which is generally known as the diaphragm, or the body which in the process of sound recording is thrown into vibration by the sound waves, and whose vibrations are traced and recorded by means of a stylus in the original record, while in the process of reproduction the diaphragm, (as a general rule, the diaphragm of a separate machine), is thrown into corresponding vibrations by a stylus to which it is attached being made to follow the undulations in the record.

The invention also relates to the sound box in which said diaphragm is mounted.

The object of my invention is to provide a diaphragm and a mounting therefor, by means of which sounds may be faithfully recorded and reproduced, which will be sensitive to sound waves and by the use of which the reproduction of sound will be improved and amplified.

Further objects of my invention are to increase the reproducing surface of a diaphragm, and, at the same time, to place the entire surface under a tension, (preferably torsional), to make it sensitive; to increase the active surface of a diaphragm of a certain given diameter; to increase the diameter of the diaphragm without making it liable to vibrate in parts, or to set up nodes or inactive portions in the diaphragm, or, in other words, to substantially increase the size of the diaphragm and, at the same time, have it vibrate throughout; to construct a diaphragm having a plurality of sound responsive elements, each of which is subjected to a molecular tension, and to subject each of a plurality of sound responsive elements to a molecular tension to increase the sensitiveness thereof and to cause them to vibrate as a whole.

Further objects of my invention will be found in the specification and claims below.

The invention consists in a diaphragm for acoustical instruments, having one or more freely resilient, sound responsive surfaces or elements, which have been brought into a condition of molecular stress, of an aggregate superficial area substantially larger than the surface of a plane disk of the same diameter, and in a recorder or reproducer in which said diaphragm is mounted.

It is found that the effect of bringing the surfaces of a vibrating body into a condition of molecular stress by torsion, is to reduce to a minimum the tendency of the vibrating body to form nodes during operation, so that the surface or surfaces of the diaphragm will vibrate as a whole and will not produce the disagreeable effect which is technically known as blasting or shattering.

One construction of diaphragm made according to this invention and the method of making it is illustrated in the accompanying drawings, in which:—

Figure 1 shows a folded strip of material from which the improved diaphragm may be made; Fig. 2 is a plan view of a modified form of folded strip of material from which a diaphragm may be made; Fig. 3 is a plan view of the diaphragm; Fig. 4 is a sectional elevation of the diaphragm; Fig. 5 is a sectional elevational view of a slightly modified form of diaphragm; Fig. 6 is a diagram to illustrate the way in which the surfaces or elements of the diaphragm are twisted; Fig. 7 is an elevation of a sound reproducing machine fitted with the diaphragm made in accordance with this invention and illustrates a convenient method of carrying the diaphragm and connecting it to the stylus bar; and Fig. 7^a is a sectional detail of Fig. 7. Fig. 8 is a plan view of the machine shown in Fig. 7; Fig. 9 is a side elevational view partly in section of a modified form of sound reproducing machine provided with my invention; Fig. 10 is an enlarged view, partly in section, of the diaphragm and stylus bar mounting shown in Fig. 9; and Fig. 11 is a bottom plan view of the reproducer shown in Fig. 9.

According to one method of carrying out this invention, a diaphragm is constructed so that it presents the form shown in Figs. 1, 3 and 4 of the accompanying drawings, in

which the whole surface of the diaphragm on either side consists of a plurality of elements reversely flexed to form a fan-like series of radially disposed ridges and furrows, the ridges on one side of the diaphragm corresponding to the furrows on the other side of the diaphragm, and the furrows gradually widening out and becoming less deep as they approach the edge of the diaphragm until at its perimeter the diaphragm lies in one plane. The elements forming the sides of the ridges and furrows provide the desired freely resilient sound responsive surfaces. A diaphragm of this form may be obtained by folding or plaiting a substantially rectangular strip of paper 1, or other suitable material in the manner shown in Fig. 1. The length of the strip of material before folding should be substantially the length of the circumference of the diaphragm to be formed therefrom, and the width of the strip should be substantially equal to the radius of the said diaphragm. When the strip has been plaited or folded in the manner above described and shown, the ends 2 and 3 should be brought together and secured to each other in any suitable manner. At this stage of the process or method, the strip will present, roughly speaking, the appearance of a cylinder having fluted sides. This strip of material is then pressed down and forced to assume the form shown in Figs. 3 and 4, one edge of the strip being crimped together at the center, and the other edge forming the perimeter; the radial ridges and furrows, or plaits being closest together and of greatest depth at the center, and gradually opening out and flattening toward the edge where the diaphragm may be held in one plane between clamping rings, as shown in Figs. 7 to 11. In Fig. 3 the diaphragm is designated as 4 and the elements forming the plaits or ridges and furrows are designated by the numeral 5. The diaphragm 4 thus formed in the manner above described will be seen to have a surface formed wholly of a multiplicity of flexed sound responsive elements, reversely sloped or angled to each other, forming dihedral ridges. The surface of the diaphragm will consist of a surface comprising salient radial angled surfaces, and radial reëntrant angled surfaces. Any sector of the surface will have a fan-like formation.

To the center of the diaphragm, is attached, in any suitable manner, the recording or reproducing stylus 6, as the case may be. As shown in Fig. 4, the diaphragm is for use with or for a record having an up and down, or vertical cut, since the diaphragm is directly provided with a stylus at its center.

For making the attachment between the stylus and diaphragm, or between the con-

nection between the stylus and the diaphragm, I prefer to bevel off the inner edge of the diaphragm as particularly shown in Figs. 2, 9 and 10. The stylus 6 may be secured directly to the inner edges of the elements of the diaphragm by being cemented or glued thereto in the manner shown in Fig. 4, or it may be secured in place by means of nuts 7, as will be more particularly described below, in connection with the form of apparatus shown in Figs. 9 and 10 and also as shown in Fig. 5. The stylus 6 may also be surrounded by rings of stiff paper 8, secured on either side of the diaphragm at the center thereof to give it additional rigidity at that point. I do not, however, limit myself to this form of connection. The effect of constructing the diaphragm in this manner, is that the whole diaphragm, *i. e.*, the surface of each element of each ridge and furrow is under molecular stress, produced by torsion, but the sides of the ridges and furrows are twisted out of the plane in which they lie at the center of the diaphragm into a plane, practically at right angles thereto at the circumference of the diaphragm. I have further found that in a diaphragm produced by this means, the tendency of the vibrating body to form nodes during operation is reduced to a minimum. The surface of each of the elements composing this diaphragm being helicoidal, and since each point in the vibrating body, as it moves, follows a direction normal to the tangential plane at this point, the result is that the direction of movement is different for each point that has to be considered so that the formation of nodes is practically impossible. It is obvious, of course, that the same condition of molecular stress would be produced upon twisting a sheet of material which naturally possessed a helicoidal or other than plane form so as to take up a position in a true plane, or other helicoidal form of different pitch.

The diagram shown in Fig. 6, illustrates clearly the torsion which is applied to each of the multiple surfaces or elements of the diaphragm when the strip of material is made to take up the form shown in Figs. 3 and 4 from the form shown in Fig. 1. In this diagram 5' represents a thin flat sheet of elastic material, such as is formed by each of the several folds or plaitings of the strip shown in Figs. 1 and 2. If the two ends of this sheet are turned in opposite directions, as indicated by the arrows, and are made to take up the position shown in dotted lines, it is found that a very resilient body is formed, which is capable of vibrating more readily, and is more sensitive, *i. e.*, more sound responsive in its new position than it was before. This is probably due to the molecular stress which is imparted to it by this twisting action. It will be clear that each of the

surfaces or folds 5, of the diaphragm illustrated in Figs. 3 and 4 is in the same condition of molecular stress, as the sheet 5' in Fig. 6.

5 The width of the folds 5, relative to the breadth of the strip in which they are made, may vary; but I have found a convenient proportion to adopt when making the diaphragm of paper is about 10 to 1, so that
10 each fold of the strip is 10 times as long as wide.

I have found that in a diaphragm having multiple resilient surfaces such as that above described, a greatly improved reproduction
15 can be obtained. Moreover, a diaphragm constructed in the manner above described can be usefully made of considerably greater diameter than has heretofore been possible. Experience has seemed to prove
20 that a plane diaphragm of mica, or other material, such as is used at the present day, if made of more than about three-and-a-half inches in diameter, loses in quality of reproduction, the reproduction becoming less musical and there being a liability to what
25 there is technically known as "shattering", due probably to the diaphragm not vibrating as a whole, *i. e.*, to the setting up of nodes in the diaphragm. I have found,
30 however, that I am able to make a diaphragm according to the present invention, as large as ten inches or more in diameter, without impairing the quality of the reproduction, and by means of this diaphragm, I
35 at the same time, attain a much greater volume of sound than with the smaller diaphragm. This amplification of the sound, I believe to be due, not only to the increased diameter of the diaphragm, but also to the
40 increased surface area of the diaphragm produced in the construction above described, by the platings or crimpings or folds in the material of the diaphragm; this appears to have the effect of putting into
45 motion a greater volume of air and so increasing the volume of sound.

A diaphragm having freely resilient sound responsive surfaces brought into a condition of molecular stress, preferably by torsion, and
50 also of an aggregate area substantially larger than a plane disk of the same diameter may of course be produced in other ways than that above described. I have found, however, that the above described method is a
55 convenient one for making the diaphragm.

The advantage arising from the use of a diaphragm constructed as above described, is that the volume of sound produced is sufficient to enable me to dispense with the
60 usual amplifying horn, and in this way, much of the metallic and hollow character usually associated with talking machine reproductions is eliminated.

Diaphragms may be made according to
65 this invention, of any suitable elastic ma-

terial, such as paper, (which may be varnished if desired), card, celluloid, metal, or the like, and the surface, or surfaces, of the diaphragm, or elements composing the vibrating body, may be put under tension by
70 any suitable means.

One means of mounting the stylus bar and diaphragm in an operative position particularly for use with a record having a
75 record of sound in the form of a groove having lateral undulations in the walls thereof is shown in Figs. 7 and 8. In this case, the diaphragm 4 is held at the edges by clamping rings 9 and 10, and, to the front ring 9,
80 may be secured a small trumpet 11 for directing the sound waves. The clamping ring 10 is fixed to a suitable backing ring 12, having radial arms 13 by which the same is carried by a tube 14 which is capable of turning freely in the bearings 15—15,
85 of the swinging arm 16, pivoted at 17 upon a rigid bracket 18, fixed to the cabinet 19. The cabinet 19 is provided with a suitable mechanism for rotating the turn-table 20 upon which a record 21 is carried in the
90 usual manner.

The tube 14 is provided at one end with a mounting 22 freely rotatable upon said tube 14, but prevented in any suitable manner, from longitudinal movement upon the
95 tube 14. This mounting 22 carries a stylus bar 23 which may be mounted thereon in any suitable manner, as by being pivoted on the knife edges 24, and retained on said knife edge bearings by a spring 25, in the usual
100 manner. The upper end of the stylus bar 23 is connected by a rod 26 with the diaphragm 5, the rod 26 being connected or attached to the diaphragm by nuts 7 in the manner shown in Fig. 5. In this construction
105 as shown in Figs. 7 and 8, the diaphragm is preferably made from a sheet of material such as is shown in Fig. 2 of the drawings so as to provide a suitable recess on each side of the diaphragm, in which the
110 nuts 7 are seated. These nuts may be further cemented or otherwise secured to the diaphragm. In the said figures the diaphragm is also shown as being provided with a stiffening ring 8 at the center of the diaphragm
115 and surrounding the stylus bar connection 26. Suitable nuts or collars 27 may be employed for holding the tube 14 from lengthwise movement in the bearings 15.

As the stylus 28 follows the record groove, the arm 16 will swing across the record on the pivot 17, and the mounting 22, carrying the stylus bar 23, will oscillate around the tube 14 with any unevenness in the rotation of the record. A suitable weight 29
120 may be attached to the mounting 22, to cause the stylus to engage the record with the requisite amount of pressure.

In Figs. 9, 10 and 11, I have illustrated a further modification of the way in which
125

my diaphragm may be used in connection with a sound reproducing machine. In said figures, the record 21 is supported upon and rotated by a turn-table 20 driven by any
 5 suitable motor within the casing 19, and the cabinet is provided with a bracket 18 similar to the arrangement above described in connection with Figs. 7 and 8. An arm 30
 10 is mounted upon a steam or pintle 31 to swing on said bracket in a plane substantially parallel with the plane of the record 21. The bracket 18 may be provided with a vertically adjustable step 32 for the end
 15 of the stem 31, which, in the form illustrated in Fig. 9, consists of a screw threaded into the bracket 18, and against which the end of the stem or pintle 31 rests. By this means, the arm 30 may be raised or lowered
 20 to adjust the parts carried thereby with respect to the record 21 on the turn-table 20, to set the stylus at the proper angle to the record surface. The free end of the arm 30 carries a yoke 33 pivoted to the said arm by a bolt or pin 34, so as to be capable of
 25 swinging in a plane substantially perpendicular to the plane of the record. The said arm 30 is provided with a stop 35, which prevents the yoke from swinging downwardly beyond a predetermined point. The
 30 outer ends of the yoke 33 are secured to lugs 36 bolted to the rings 37, 38, by bolts 39, passing through said rings and said lug. Screws 40, passing through the ends of the yoke 33 and into the lugs 36, form the
 35 pivots to permit the rings and the parts carried thereby, to oscillate thereon. The diaphragm 41 is of the kind which I have described above; that is to say, the diaphragm is formed by reversely folding a sheet of
 40 material to form plaits, each plait forming an element of the diaphragm, and each of these plaits or elements is subjected to a torsional tension or strain by the bringing of the folded or plaited sheet of material
 45 into a substantially circular form. In these Figs. 9 to 11, the diaphragm is shown practically as being formed from a sheet of material such as is shown in Fig. 2; that is to say, a strip in which each plait is cut away
 50 at its inner corners so as to form a recess on each side of the center of the diaphragm to permit of a convenient attachment of the stylus bar to the diaphragm. As is plainly shown in Fig. 10, the diaphragm
 55 41 is clamped between the rings 37 and 38, and securely held in that position by means of the screws 42 passing through the said rings and drawing them together. I prefer, however, to interpose, between the rings 37
 60 and 38, and the diaphragm, thin rings 43—43 of a suitable non-metallic and preferably slightly elastic material, one on each side of the diaphragm. These rings 43, may be of fabric, or rubber, or fiber, or any other
 65 suitable material to prevent an actual con-

tact between the diaphragm and the metallic rings 37 and 38, and to securely hold the periphery of the diaphragm in a single plane. A suitable small trumpet 11 may be
 70 also secured between the rings for the purpose of directing the sound waves. I have shown it plainly in Figs. 9 and 10 as composed of a slightly flaring substantially conical member having a flange 11' clamped
 75 between the rings 37 and 38, the screws 42 passing therethrough. The periphery of the diaphragm 41 is clamped between the intermediate rings 43, and held thereby in a single plane as plainly shown in Fig. 10.

The bottom of the reproducer is provided
 80 with a suitable support for the stylus bar, said support comprising a bar 44 secured to the ring 38 by screws 45, or in any other suitable manner. The said bar 44 may carry a block 46 rigidly secured thereto and upon
 85 the lower side of said block. I mount the stylus bar. Any suitable mounting for the stylus bar may be employed, but in the said modification illustrated in Figs. 9 to 11, I have shown the block 46 as provided with a
 90 pair of alined knife edges 47 engaging suitable recesses and lateral extensions 48 of the stylus bar 49. Each lateral extension is provided with a spring 50, one end of which is attached to said extension 48, and the
 95 other end of which extends outwardly and is provided with a hole through which a screw 51 passes, the head of the screw engaging the end of said spring 50 and the screw being threaded in a suitable tapped
 100 plate 52 carried by the said block 46. In this way the stylus bar is yieldingly held upon the knife edges 47, but is free to oscillate upon them as bearings. The lower end of the stylus bar is provided with a suitable
 105 set screw 53 for securing the stylus 54 in the socket therein. The stylus bar 49 may have a portion 49' extending at an angle to the stylus carrying portion and it may then extend upwardly as at 55 to this point of
 110 attachment to the center of the diaphragm. I have shown the said upwardly extending portion 55 as being curved in order to make it slightly yielding, and the point between the portions 49' and 55 as being materially
 115 weakened to enable the stylus bar to readily bend or spring or give slightly at this point to transform the vibratory movement of the stylus into a reciprocatory movement of the portion 55 which is directly attached to and
 120 consequently communicates its motion to the center of the diaphragm.

In adjusting the reproducer to the recorded surface, the arm 30 should be set at such a height that the stylus will be given
 125 a slight rake to the recorded surface, as plainly shown in Fig. 9. This will permit the record to slide freely beneath the stylus without unduly scratching the same and cause the stylus to engage the record with 130

a sufficient pressure to insure the tracking of the stylus in the record groove. The record may then slide freely beneath the stylus, and the whole reproducer may swing slightly on the bolts or pins 40 to allow for any irregularity or unevenness or warp in the recorded surface.

In order that the stylus may not bear too heavily upon the record, the trumpet 11 may be provided with a suitable counter-balance-weight 59.

From the preceding description it will be plain that the whole construction is such that the trumpet, diaphragm, rings and stylus attached thereto may be swung upwardly about the bolts or pin 34 as a pivot for the purpose of replacing the stylus or for throwing the whole device into an inoperative position, as indicated in dotted lines in Fig. 9.

In operation it will be apparent that when the record is given a rotary movement from the turn-table 20 and the stylus 54 engages the record 21, the whole reproducer will swing about the stem or pintle 31 as a pivot allowing the needle or stylus 54 to track across the record and the stylus will be caused to assume the correct angle to the recorded surface by the adjustment of the step 32 against which the stem or pintle 31 abuts, and further, that the stylus will be prevented from bearing too heavily upon the record by the counter-weight 59 attached to the upper end of the trumpet 11.

In all the forms which I have above described, it will be seen that the diaphragm is constructed upon the same principle, and that it is mounted in substantially the same manner, and that any suitable manner of securing the stylus to the center of the diaphragm may be employed, and while I have shown a small trumpet 11 in connection with the constructions which I have illustrated, it is to be understood that the trumpet may be entirely dispensed with if desired, the function being to give direction to the sound waves rather than to increase the volume of the sound reproduced by the diaphragm.

Having thus described my invention, what I claim and desire to protect by Letters Patent of the United States, is:

1. The method of making a diaphragm which consists in plaiting a strip of suitable material, joining the ends of the plaited material and bringing the same to a circular

shape to form a diaphragm in which each of the plaits forms an element subjected to torsional tension.

2. The method of making a diaphragm which consists in plaiting a strip of flexible material, joining the ends of the plaited material and subjecting each of the plaits to a torsional tension.

3. The method of making a diaphragm which consists in reversely folding a strip of flexible material into a series of plaits, removing a corner of each of said strips, bringing the ends of said plaited material together and forming the same into a substantially circular shape having radial salient and reëntrant angles.

4. The method of making a diaphragm which consists in reversely folding a strip of flexible material, twisting the folded sheet into substantially circular shape and rigidly holding the edges of the diaphragm so formed in a single plane.

5. The method of forming a diaphragm, which consists in plaiting a substantially rectangular strip of material, removing a corner of each plait on one side of the strip, uniting the ends of the strip and forming the said material into a substantially circular diaphragm, each of the plaits forming an element of the diaphragm with its edge at the center of the diaphragm substantially parallel to the axis of the diaphragm and the edge of each plait at the periphery of the diaphragm being brought to substantially a single plane.

6. The method of forming a diaphragm, which consists in plaiting a substantially rectangular strip of material, uniting the ends of the strip and forming the said material into a substantially circular diaphragm, each of the plaits forming an element of the diaphragm with its edge at the center of the diaphragm substantially parallel to the axis of the diaphragm, the edge of each plait at the periphery of the diaphragm being brought to substantially a single plane, and securing an annular strip of stiffening to the edges of the elements adjacent the center of the diaphragm.

In witness whereof I have hereunto set my hand this fourth day of June, A. D. 1909.

LOUIS LUMIERE.

Witnesses:

L. S. RIDDIN,
A. J. COOLEY.

W. S. COBB.
SOUND DISTRIBUTING HORN.
APPLICATION FILED APR. 12, 1910.

986,908.

Patented Mar. 14, 1911.

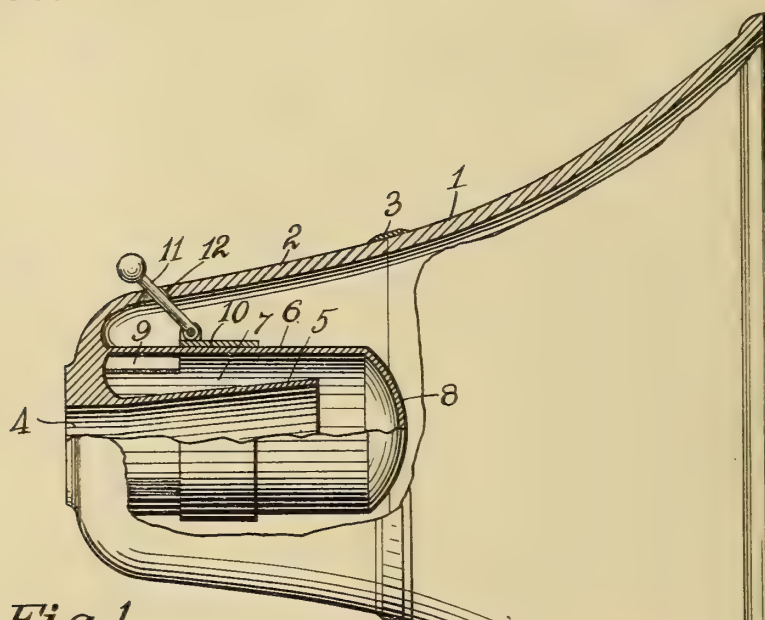


Fig. 1.

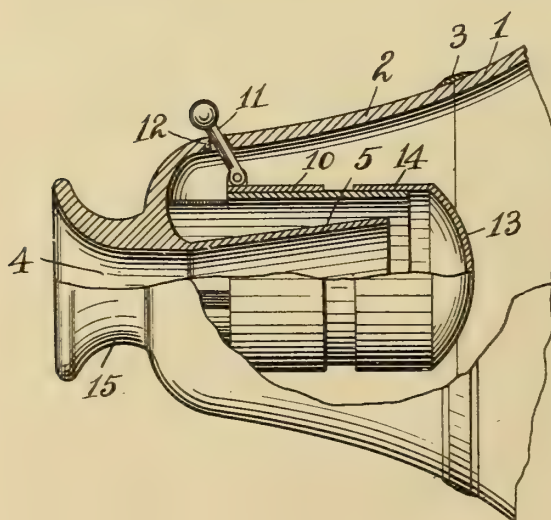


Fig. 2.

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UNITED STATES PATENT OFFICE.

WILLIAM S. COBB, OF FLUSHING, NEW YORK.

SOUND-DISTRIBUTING HORN.

986,908.

Specification of Letters Patent.

Patented Mar. 14, 1911.

Application filed April 12, 1910. Serial No. 555,027.

To all whom it may concern:

Be it known that I, WILLIAM S. COBB, a citizen of the United States, residing at Flushing, in the county of Queens and State of New York, have invented new and useful Improvements in Sound-Distributing Horns, of which the following is a specification.

The invention relates to an improvement in sound regulators, being more particularly directed to the construction of a sound intensifying horn whereby such sound is rendered more distinctive and the tone thereof materially improved.

The main object of the present invention is the provision of a sound regulator formed to provide a plurality of interior sound passages through which the sound waves are arranged to travel in succession, the construction and control of such passages providing for the rapid and uniform expansion of the sound volume in traveling from one passage to the next whereby to intensify and improve the tone of such sound.

The invention in its preferred details of construction will be described in the following specification, reference being had particularly to the accompanying drawings, in which:—

Figure 1 is a view in elevation, partly in section, of the improved horn. Fig. 2 is a similar view broken away, showing a slightly different construction.

Referring particularly to Fig. 1 of the accompanying drawing, the improved horn may be said to comprise a tube or body section 1 and a mouth section 2, which sections are removably connected at 3 in any appropriate or preferred manner, whereby they may be assembled in horn-forming relation or disconnected for close packing in storage or transportation. Arranged within the mouth section and communicating with the sound inlet opening 4 therethrough is an inner sound tube 5, which tube extends within the mouth section of the horn an appropriate distance, is of gradually increased diameter from the inlet to the outlet end and is open at the inner end. Secured within the mouth section 2 and encircling the tube 5 is what I term an outer tube 6. This tube is preferably of uniform diameter throughout its length and secured so that it is disposed in spaced relation throughout its length with the inner tube 5, whereby the chamber 7 is arranged between the tubes. By reason of the gradually increasing diam-

eter of the tube 5 from the inlet to the outlet, and the uniform diameter of the tube 6, it will be noted that the chamber 7 gradually increases in area from the end thereof adjacent the free ends of the tubes 5 and 6 toward the end adjacent the connected ends of said tubes 5 and 6. In other words, the space within the tube 5 gradually increases toward the outlet end of said tube while the space within the chamber 7 gradually increases in area in the opposite direction.

The tube 6 is preferably closed at the forward or free end, as at 8, and formed adjacent the opposite end with a series of openings 9. These openings may be of any contour or size being preferably, however, arranged in a concentric row. The openings 9 serve to establish communication between the chamber 7 and the horn proper, or that space surrounding the tube 6 within the mouth section of the horn. To provide for regulating these openings and thereby governing the volume of sound passing there-through, I arrange what I term a valve 10 including an annular strip slidably mounted on the outer surface of the tube 6 and operated through the medium of a finger lever 11 projecting from an opening 12 formed in the mouth section. By proper manipulation of the finger lever, the slide valve 10 may be arranged to vary the size of the openings 9 in accordance with the volume of sound desired, as will be clearly obvious from the drawings.

In Fig. 2, the construction is identical with that just described except that the tube 6 is provided with a removable cap 13, which cap, in addition to its removability and by reason of an extended edge flange 14, is capable of adjustment longitudinally on the tube 6 so as to dispose the transverse wall of the cap at varying distances with respect to the free end of the tube 5, whereby the chamber, immediately in advance of said tube may be varied in size to control the volume of sound passing from the tube 5 to the chamber 7. In this form of the device, I have also shown a mouthpiece 15 connected with the structure though it is to be understood that such form, no material part of the invention and may be omitted or used as desired.

In the use of the improvement several advantageous results follow. For example, a distinctly improved tone is imparted to the sound issuing from the horn as compared

with the usual horn structure by reason of spreading waves at the end of the inner tube and again at the end of the outer tube. In this result the adjustability of the cap 13
5 to vary the size of the chamber at the end of the inner tube provides for regulating the increase in volume at this point, as desired. Again, the inner tube diverges toward its outlet providing for the gradual spreading
10 of the sound waves, which gradual spreading is also maintained in the chamber 7. Furthermore, the adjustability of the valve 10 controlling the outlet from the chamber 7 to the horn proper provides a further
15 means for manually regulating the volume of sound.

It is of course to be understood that while the improved horn is designed primarily for use with reproducing machines, as
20 gramophones and the like, it is to be understood that its use is contemplated with any and all devices in which sound volume is to be increased, such as megaphones, horns of any type and the like.

25 Having thus described the invention, what I claim as new, is:—

1. A horn, an inner tube arranged therein, an outer tube encircling the inner tube and communicating therewith, means for vary-

ing the space at the point of communication, 30 and means for adjustably controlling the communication between the outer tube and the horn proper.

2. A horn, an inner tube arranged therein, an outer tube encircling the inner tube 35 and communicating therewith, and means for varying the space at the point of communication, said outer tube being formed with openings establishing communication between the same and the horn proper and 40 manually operable means for varying the size of the openings.

3. A horn, an inner tube arranged therein, an outer tube encircling the inner tube and communicating therewith, means for 45 varying the space at the point of communication, said outer tube being formed with openings to establish communication between said tube and the horn proper, and a manually operable valve for simulta- 50 neously controlling the size of said opening.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM S. COBB.

Witnesses:

LESTER S. PARMENTER,
JOHN J. KLEIN.

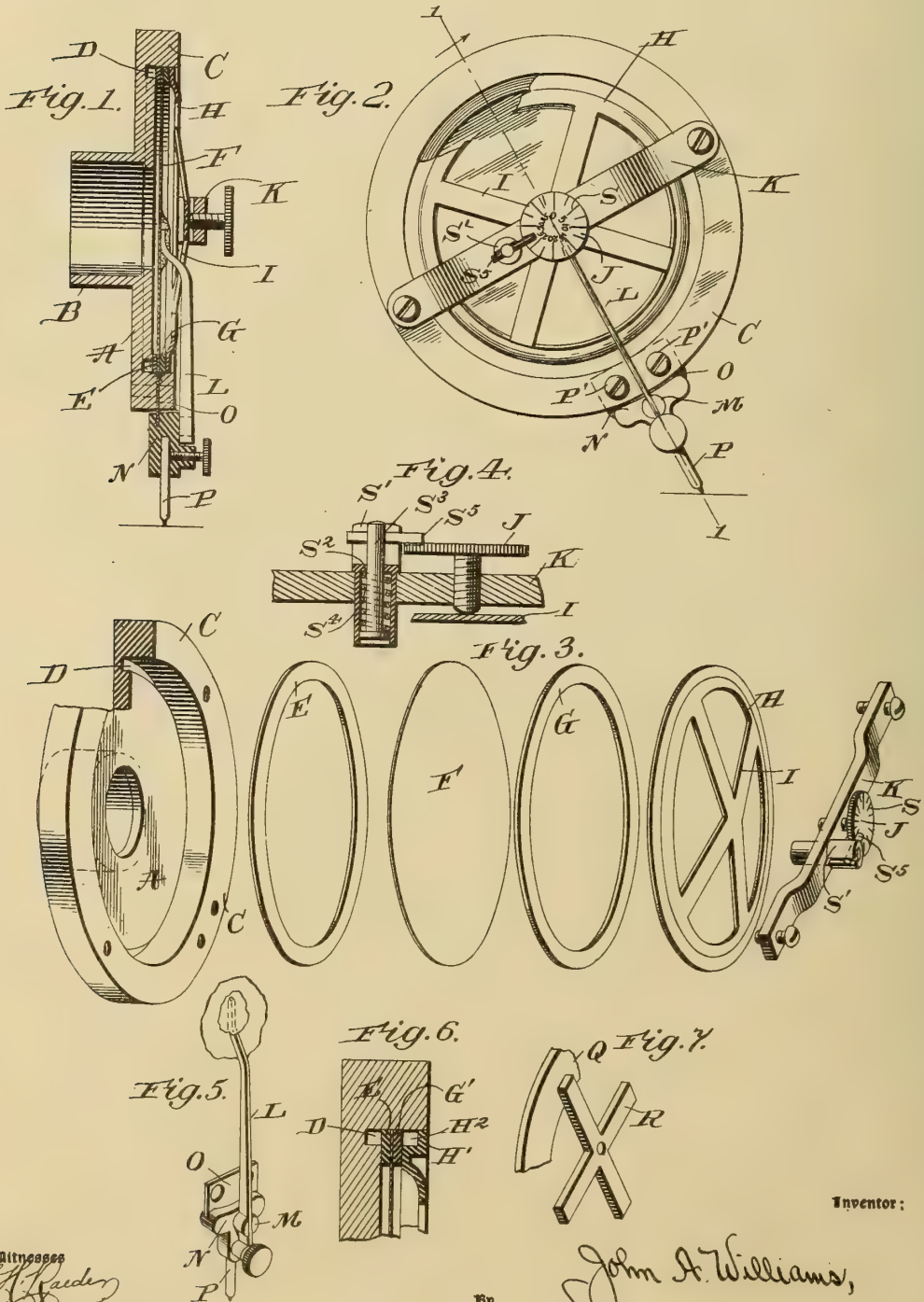
J. A. WILLIAMS.

SOUND BOX.

APPLICATION FILED JUNE 18, 1904.

987,205.

Patented Mar. 21, 1911.



Inventor:

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By

UNITED STATES PATENT OFFICE.

JOHN A. WILLIAMS, OF BROOKLYN, NEW YORK, ASSIGNOR TO HENRY C. MILLER, OF WATERFORD, NEW YORK.

SOUND-BOX.

987,205.

Specification of Letters Patent. Patented Mar. 21, 1911.

Application filed June 18, 1904. Serial No. 213,175.

To all whom it may concern:

Be it known that I, JOHN A. WILLIAMS, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Sound-Boxes, of which the following is a specification.

My present invention pertains to improvements in sound-boxes, the construction and advantages of which will be hereinafter set forth, reference being had to the annexed drawings, wherein:

Figure 1 is a longitudinal sectional view, on the line 1—1 of Fig. 2; Fig. 2 a front face view, the compression-ring or plate being partially broken away; Fig. 3 a perspective view of the various parts of the box, with the exception of the stylus-bar or arm; Fig. 4 a vertical sectional view of the combined indicating and locking device for the adjusting-screw; Fig. 5 a perspective view of the stylus-bar or arm; Fig. 6 a sectional view on a somewhat enlarged scale, showing a slight modification of the mounting of the diaphragm; and Fig. 7 a perspective view of a modification of the means employed clamping the diaphragm.

The primary object of my invention is to obtain a sound-box which may be readily assembled and adjusted by a person having but slight mechanical skill, the box then giving as good results as if assembled by an expert in such work.

A further object is to provide means whereby the pressure on the edge of the diaphragm may be varied, and the condition of the diaphragm so changed thereby that it will accommodate itself to the class of work being undertaken. In other words, the box has a wide or universal range, reproducing high and low notes, "blast" notes, and the tones of various instruments, or combinations of instruments with equal facility, and the tones produced being perfectly true at all times. The adjustment of the diaphragm also permits it to be regulated in accordance with the acoustic properties of the room or space in which the instrument is being employed.

A still further object of the invention is to provide means whereby the adjusting screw (which is employed to vary the

amount of compression on the ring or plate) may be locked in position, and the degree of compression indicated by a combined scale and pointer.

In the construction shown in Figs. 1, 2 and 3, A denotes the shell or casing, having a sleeve B for attachment to the instrument, as usual. Within the lower portion of the shell, adjacent to the upstanding wall or rim C thereof, is formed a groove or channel D, a washer or gasket E, preferably of high-grade rubber, overlying said groove and bearing at its inner edge upon the bottom of the shell. A diaphragm F of mica, glass or other suitable material rests upon the gasket E, and a second packing-ring or gasket G is placed upon the diaphragm. A compression-ring or plate H overlies the parts thus assembled, said ring or plate (as shown in Figs. 1, 2, 3 and 6) being provided or formed with integral cross-bars I, which curve slightly upward from said ring. An adjusting-screw J is mounted in a supporting-bar K, secured to the shell or casing, the lower end of said screw being slightly rounded and bearing upon the cross-bars at their point of junction.

As will be readily appreciated, the degree of compression upon the diaphragm may be varied as desired, and the pressure exerted will be uniform by reason of the fact that force is applied to the ring or compression plate at one point only, namely, the center thereof, so that the pressure is exerted evenly upon the diaphragm adjacent to its periphery or edge. In other words, the compression plate may be said to have a universal tipping or tilting movement, with the rounded end or point of the adjusting screw as a fulcrum. This universal movement permits the ring or plate to adapt itself to any minute irregularities which may exist in the parts, particularly in the diaphragm, thus preventing the latter from becoming wrinkled or distorted. As the screw J is turned inwardly, the parts are, of course, put under greater stress, and the quality of the tone becomes correspondingly sharper or thinner, while the reverse is true as the screw is loosened. When the screw is turned inwardly, the lowermost gasket F is expanded circumferentially and crowded

into groove or channel D to a greater or less degree, thereby tending to stretch the diaphragm and arch it to a slight extent, causing it to become extremely resilient and capable of producing a sharper or thinner quality of tone. The tension thus caused has no tendency to wrinkle, furrow or distort the diaphragm, which is especially apt to occur in case a mica diaphragm having slight undulations in its surface is used.

In order to ascertain the degree of compression exerted by the screw and to hold the same in its adjusted position, the upper face of the head of the screw is provided with a series of radial notches or recesses S, graduated as shown in Fig. 2. A barrel or tubular member S' is mounted in the bar K, the opening in the lower portion of the barrel being larger than that in its upper portion, thus forming a shoulder S². A rod or plunger S³ is mounted in the tubular member S', and a spring S⁴ surrounds said plunger, bearing against the head thereof at its lower end and against the shoulder S² at its upper end, thereby tending to draw the plunger downwardly in the tubular member. Said plunger is provided at or near its upper end with a cross-pin S⁵, which works in slots formed in the head of the tubular member S', the outer end of the cross-pin S⁵ overlying the head of the adjusting-screw J and entering the notches S formed therein as the adjusting-screw is rotated and its notches are brought into alinement with the cross-pin. It will thus be seen that the spring tends to hold the cross-pin in engagement with the adjusting-screw, and consequently locks said screw against accidental rotation, thereby preventing any change in the degree of compression exerted upon the diaphragm except when the screw is manually operated. The cross-pin therefore serves the double function of an indicator and a locking device.

In Fig. 6 a modification of the invention is shown, wherein the presser-plate or ring H' is formed with a circumferential groove or recess H², which provides a space for the expansion of gasket G', overlying the diaphragm. With this arrangement the diaphragm may be put under stress or tension without being arched. The adjustment of the ring or presser-plate permits the adjustment of the device to compensate for deterioration of the gaskets, whether the presser-plate be provided with a groove as H² (Fig. 6) or be of the form designated by H, Figs. 1, 2 and 3.

The stylus-bar L is connected at its inner end to the diaphragm, to one side of the center thereof, see Figs. 1 and 2, by any suitable adhesive, the outer end of the bar being soldered, sweated or riveted in a groove or saw-cut formed in a post or stud M, extending upwardly from a head or block N. A

thin web or plate O, permanently secured to the head N, or formed as an integral part thereof, extends outwardly therefrom in line with bar L, entering a saw-cut formed in the side wall C, and being secured in place by screws P'.

Any material possessing sufficient tenacity or strength may be employed in constructing the web or plate. Copper, of 5/1000 of an inch in thickness has thus far given the best results.

As will be seen upon reference to Fig. 1, the web stands in approximate alinement with the diaphragm, and by reason of this fact and the further fact that the head N lies close to wall C of the frame, no endwise movement of the stylus-bar can take place. It simply rocks upon a line which extends through the web, and as the latter is preferably formed of a material possessing but slight resiliency there is in effect practically no resistance to the rocking of the stylus-bar when moving in consonance with the diaphragm. As will be seen, there are no loose parts; no parts to be adjusted, and, as a consequence, no parts which can produce a rattling noise.

The head N carries the usual needle or stylus P. The inner end of the stylus-bar just clears the diaphragm when the parts are assembled, and previous to its being secured to the diaphragm,—consequently there is no tendency of the bar to buckle the diaphragm, as is the case in the usual construction, in which a screw passing through the diaphragm enters the end of the stylus-bar.

As previously noted, the stylus-bar is connected to the diaphragm to one side of the center thereof, or more nearly adjacent to that side of the frame to which the web O is secured. The point of attachment is, therefore, approximately coincident with the center of a line extending from the rocking-point of the bar to the diametrically opposite side or edge of the diaphragm, thus insuring the greatest possible range of movement.

In Fig. 7 a slight modification of the invention is illustrated. Instead of making the presser-plate or ring and the cross-bars integral, they are separately formed, the ring being designated by the letter Q and the spider or intermediate frame by R.

With a compression ring or plate constructed as shown in Figs. 1, 2 and 3, that is to say, formed of relatively light metal, struck up in a die, there is a tendency for the ring to respond slightly to the vibrations of the diaphragm, though not to a sufficient degree to prove detrimental in practice. The rigidity of the structure, however, is such as to permit the required degree of compression to be applied to the diaphragm.

As hereinbefore stated, the several parts of the box may be readily assembled and

adjusted, and further the compression on the diaphragm is equal throughout the entire extent of the plate or ring.

Having thus described my invention, what I claim is:

1. In a sound-box, the combination of a frame; a diaphragm mounted therein; a stylus connected to the diaphragm; a compression-plate adjacent to the edge or periphery of the diaphragm; and means for applying pressure centrally to said compression-plate, whereby the pressure upon the diaphragm may be varied as desired but maintained even throughout the entire bearing surface of the diaphragm, substantially as described.

2. In a sound-box, the combination of a frame; a diaphragm mounted therein; a stylus connected to the diaphragm; a compression-plate adjacent the diaphragm; and means for applying pressure to said plate and permitting it to rock or tilt with reference to said means, whereby the pressure may be varied as desired but will be even throughout the entire bearing surface of the plate, substantially as described.

3. In a sound-box, the combination of a frame having a groove or channel formed therein; a packing-ring overlying said groove or channel; a diaphragm; a second packing-ring mounted upon the diaphragm; a presser-plate or ring having a groove or recess formed adjacent to its periphery, said plate overlying the second packing-ring; and means for applying pressure to said plate or ring.

4. In a sound-box, the combination of a frame; a gasket or packing-ring mounted therein; a diaphragm mounted upon said packing-ring; a second packing-ring resting upon the diaphragm; a compression-plate or ring mounted upon said packing-ring, said plate being provided with cross-bars or members I; a supporting-bar secured to the frame and extending over the compression-plate; and an adjusting-screw carried by said bar and bearing at its lower end upon the cross-bars of the compression-plate.

5. In a sound-box, the combination of a frame; a diaphragm mounted therein, said diaphragm being free to expand circumferentially; and means tending to stretch said diaphragm, substantially as described.

6. In a sound-box, the combination of a frame; a diaphragm mounted therein and free from direct connection therewith; and means for applying pressure to and expanding the diaphragm circumferentially, substantially as described.

7. A sound box comprising a casing having an annular flange, a substantially flat diaphragm within the casing, a flange on which the diaphragm is seated, and means acting on an annular line within the margin of the annular flange on the casing to dish

said diaphragm in concavo-convex form throughout its entire area to alter the pitch of the latter.

8. In a sound-box, the combination of a suitable frame; a diaphragm mounted therein; a stylus-bar connected said diaphragm; and a web connecting said bar directly to the frame, the web lying in substantially the same plane as the diaphragm.

9. A sound box comprising a diaphragm, a washer on which the diaphragm is seated, a washer acting on an annular line on the opposite side of the diaphragm to dish the latter in concavo-convex form throughout its entire area, and means operating the latter washer.

10. In a sound-box, the combination of a suitable frame; a diaphragm mounted therein; a stylus-bar connected to said diaphragm at a single point to one side of the center of the diaphragm; and a rocking connection between said stylus-bar and frame.

11. In a sound-box, the combination of a suitable frame; a diaphragm mounted therein; a stylus-bar; a connection between said stylus-bar and the frame; and a single connection between the stylus-bar and diaphragm substantially midway between the connection of the bar to the frame and the diametrically opposite side of the diaphragm, substantially as and for the purpose described.

12. In a sound-box, the combination of a suitable frame; a diaphragm mounted therein; a compression-plate; means for actuating said compression-plate; and means for determining the degree of compression, substantially as described.

13. In a sound-box, the combination of a suitable frame; a diaphragm mounted therein; a compression-plate; a screw for adjusting said plate; and a scale working in conjunction with said screw.

14. In a sound-box, the combination of a suitable frame; a diaphragm; means for varying the state of tension of said diaphragm; and means for determining said tension.

15. In a sound-box, the combination of a suitable frame; a diaphragm; means for varying the state of tension of said diaphragm; and means for determining the degree of tension and locking the tension varying means in position.

16. In a sound box, the combination of a suitable frame; a diaphragm mounted therein; a compression plate; a screw for adjusting said plate; a scale working in conjunction with the screw; and means for locking the screw in position.

17. In a sound box, the combination of a suitable frame; a diaphragm mounted therein; a compression plate; a screw for adjusting said plate, the screw being provided with a series of notches; and a spring

pressed pin working in conjunction with said notches.

18. In a sound-box, the combination of a suitable frame; a diaphragm mounted therein; a compression-plate; a screw for adjusting said plate, the screw being provided with a series of notches and graduations in line with said notches; and a spring-pressed pin working in conjunction with said notches and serving to indicate the degree of compression and to hold the screw in its adjusted position.

19. In a sound-box, the combination of a suitable frame; a diaphragm mounted therein; a compression-plate; a supporting-bar; a screw for adjusting said plate, the screw being provided with a series of notches in its upper face; a tubular member carried by said supporting-bar adjacent to the screw; a spring-pressed plunger mounted in said tubular member; and a cross-pin carried by the upper end of the plunger, the outer end of said pin lying in the same plane as the notches formed in the screw, substantially as described.

20. In a sound-box, the combination of a frame; a diaphragm mounted therein; and a resilient compression ring free at its periphery for holding the diaphragm.

21. In a sound-box, the combination of a frame; a diaphragm mounted therein; a resilient compression-ring for holding said diaphragm, said ring being free at its periphery; and means for adjusting the pressure of said ring.

22. In a sound-box, the combination of a frame; a diaphragm mounted therein; a compression-plate bearing on the diaphragm and free at its outer edge; and means for applying pressure centrally to said plate.

23. A sound-box comprising a diaphragm; means for altering the pitch of the diaphragm; an adjustable indicator coöperating with the pitch-altering means; and means for holding the indicator in adjusted position.

24. In a sound box, the combination of a frame formed with an annular groove, a diaphragm, a gasket interposed between the diaphragm and frame, the free edge of the gasket being adjacent the groove, and a resilient compression ring free at its periphery and adjacent the edge of the diaphragm to stretch the latter.

25. In a sound box, the combination of a frame formed with an annular groove, a diaphragm, a gasket interposed between the diaphragm and frame, the free edge of the gasket being adjacent the groove, a resilient compression ring adjacent the free edge of the diaphragm, said ring being free at its periphery, and means for adjusting the pressure of said ring, to stretch the diaphragm.

26. A sound box comprising a diaphragm, means for altering the pitch of the dia-

phragm, and an adjustable indicator co-operating with the pitch altering means.

27. In a sound box, the combination of a suitable frame, a diaphragm therein, a compression plate, a screw for adjusting said plate, and a scale working in conjunction with the screw.

28. In a sound box, the combination with a frame, formed with a recess, a thin plate fitting in the recess, a stylus lever supported on the thin plate, and a diaphragm with which the stylus lever coöperates.

29. In a sound box, the combination with a casing formed with a recess at its edge in alinement with the center of the casing, a diaphragm in the casing, a thin plate fitting in the recess, a stylus lever supported on the thin plate at a point beyond the edge of the casing, said stylus lever extending from the support in a radial line with the center of the diaphragm.

30. A sound box comprising a diaphragm, means for altering the pitch of the diaphragm including a frame, the free edge of which is located adjacent the edge of the front of the diaphragm, a support in front of the casing and the frame, and an adjusting device mounted in the front support and bearing on the frame to stretch the diaphragm.

31. In a sound box, the combination with a casing formed at its edge with a radial recess, a diaphragm, a flat thin plate fitting in the recess, a stylus lever supported on the flat thin plate, a stylus carried by the stylus lever at a point below the thin plate.

32. A sound box comprising a diaphragm, means coöperating with the diaphragm for altering the pitch, and an indicating device attached to the pitch altering means to indicate the degree of pitch of the diaphragm before operating the sound box.

33. A sound box comprising a diaphragm, means coöperating with the diaphragm for altering the pitch, an indicator forming a part of said pitch altering means, and independent means for adjusting said indicator.

34. A sound box having a diaphragm, resilient washers adjacent the diaphragm, a spider for compressing the washers, and a single screw for adjusting the spider to regulate the pressure of the spider on the washers.

35. A sound box comprising a diaphragm, means for altering the pitch of the diaphragm, an indicator coöperating with the pitch altering means, and means for limiting the movement of the indicator.

36. A sound box comprising a casing, a diaphragm in the casing, a stylus lever co-operating with the diaphragm, and a flat resilient plate extending from the periphery of the casing parallel with the diaphragm, and means for securing the flat resilient plate to the casing and the stylus lever, said

flat resilient plate being unrestrained intermediately of its points of attachment to the casing and stylus bar.

37. A sound box comprising a casing 5 formed with a groove, a flat resilient plate fitting in the groove and extending from the periphery of the casing and disposed wholly within the front and rear planes of the opposite walls thereof, and parallel to said 10 walls, a diaphragm in the casing, and a stylus lever formed with a groove and secured to the diaphragm, the outer end of the flat resilient plate fitting in the groove in the stylus lever, said flat resilient plate being unrestrained 15 intermediately of its points of attachment to the casing and stylus bar.

38. A sound box comprising a casing, a flat resilient plate extending from the periphery of the casing in a direction which is 20 at an angle to the axis of said casing, a diaphragm in the casing, a stylus lever extending from the diaphragm and connected to the casing by the flat resilient plate, said flat resilient plate being unrestrained intermediately of its points of attachment to the 25 casing and stylus bar.

39. A sound box, comprising a casing formed with a groove, a flat resilient plate fitting in the groove and extending from the 30 periphery of the casing in a direction at an angle to the axis of said casing, fastening means passing through the casing and the flat resilient plate to hold the latter in position, a diaphragm, and a stylus lever extending from the diaphragm and overlapping 35 the periphery of the casing, and formed with a groove, the outer end of the flat resilient plate fitting in the latter groove.

40. A sound box comprising a casing, a stylus lever, a stylus, a diaphragm, a flat resilient plate attached to and extending 40 from the periphery of the casing, and attached at its opposite end to the stylus lever, and the diaphragm stylus and resilient plate 45 being in a single plane, said flat resilient

plate being unrestrained intermediately of its points of attachment to the casing and stylus bar.

41. A sound box comprising a casing, a diaphragm, a stylus bar, and a flat resilient 50 plate extending from said casing in a plane at an angle to the periphery of said casing and attached to the casing and the stylus bar at oppositely disposed ends, said plate being unrestrained intermediately of said 55 points of attachment.

42. In a sound box, the combination of a casing, a diaphragm, a stylus bar having a rigid arm, a spring fulcrum, parallel to the face of the diaphragm and having one end 60 fastened rigidly to the rigid arm and its other end fastened to the casing, the said spring fulcrum being flexible between the stylus arm and the casing, and unrestrained intermediately of said points of connection. 65

43. In a sound box, the combination of a casing, a diaphragm, a stylus bar, a flexible spring fulcrum extending from the outer surface of the casing and parallel with the face thereof, said spring fulcrum being 70 rigidly fastened to the casing and the stylus bar, there being a minute flex between the points of connection of the spring, and the latter being unrestrained between its points of attachment. 75

44. A sound box comprising a casing, a diaphragm, a stylus bar, and a resilient connection extending from said casing in a plane at an angle to the periphery of said casing and attached to the casing and stylus 80 bar at oppositely disposed ends, said resilient connection being unrestrained intermediately of said points of attachment.

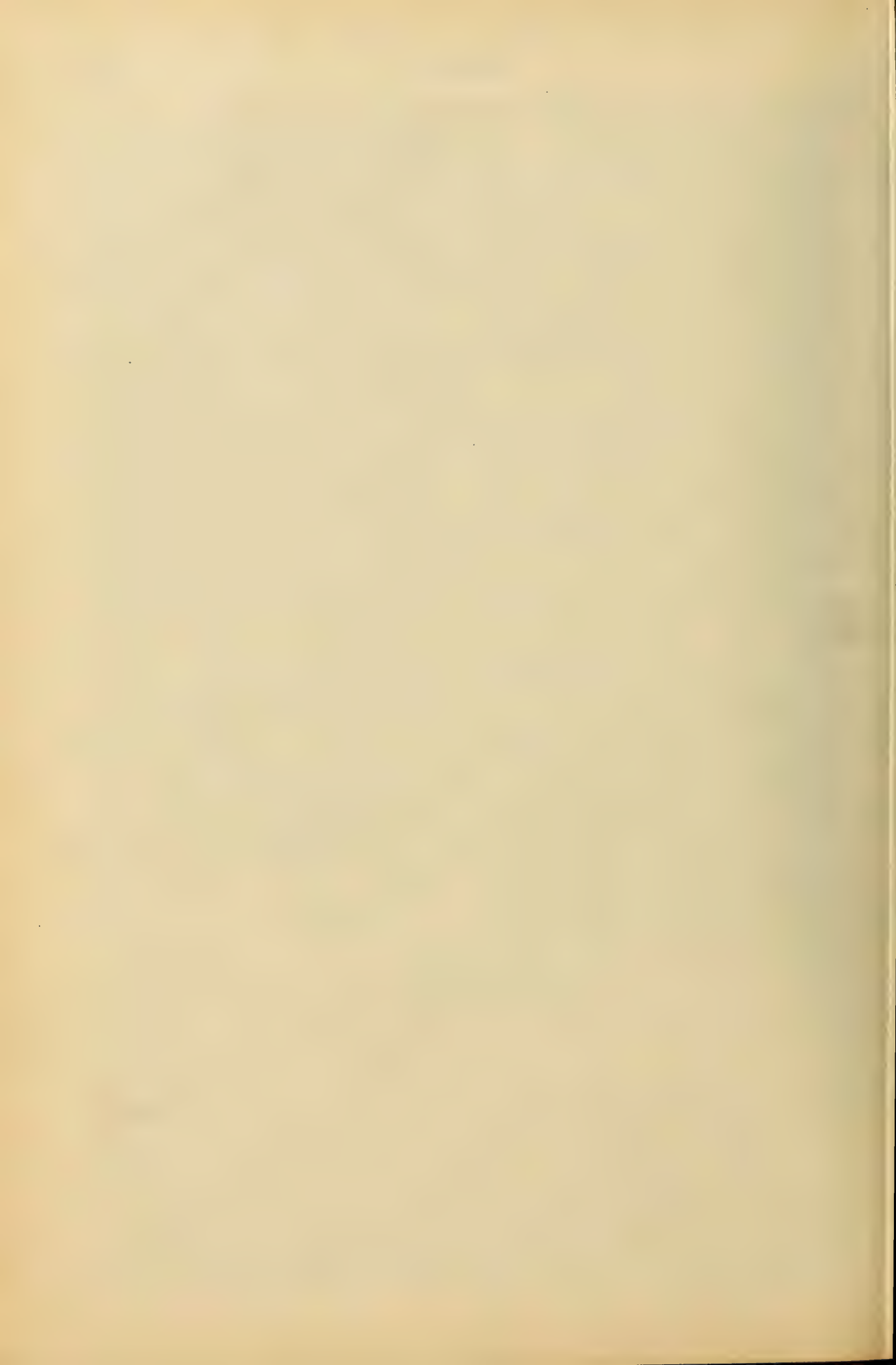
In testimony whereof I have signed my name to this specification in the presence of 85 two subscribing witnesses.

JOHN A. WILLIAMS.

Witnesses:

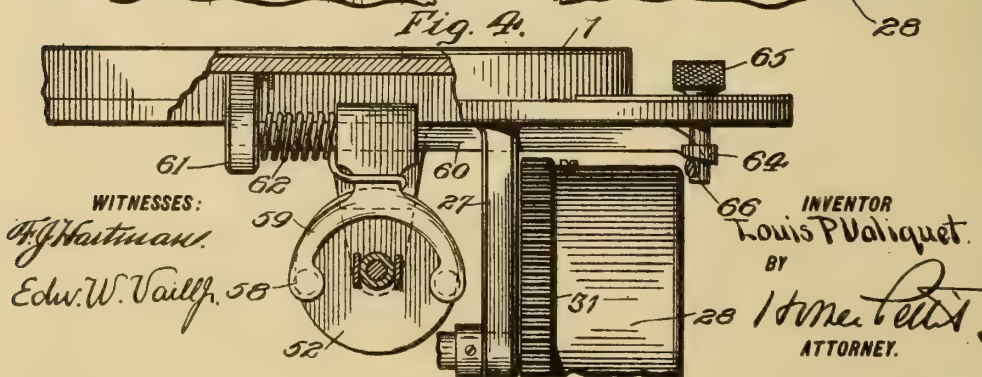
R. H. MORRIS,

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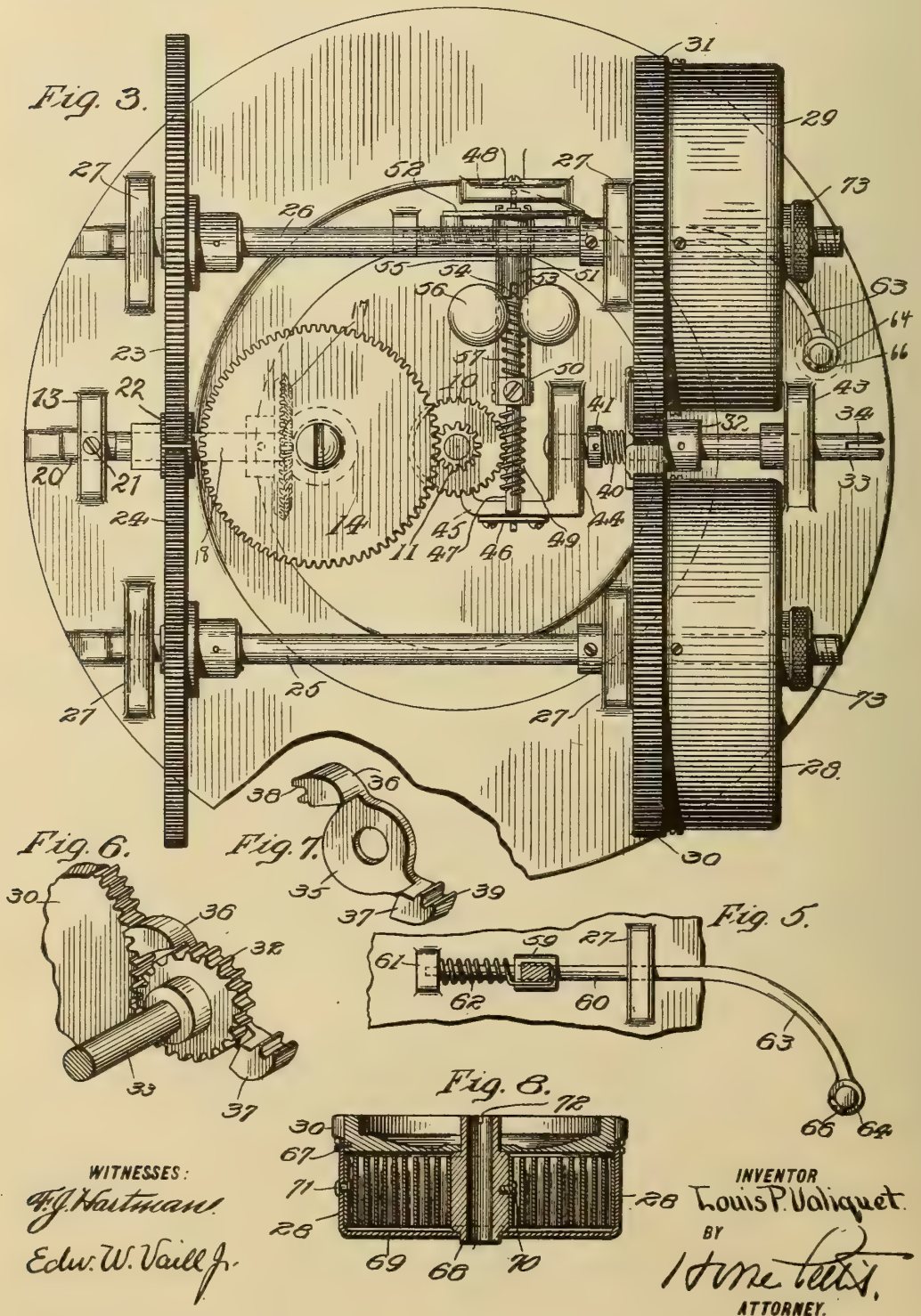


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MOTOR FOR TALKING MACHINES.
APPLICATION FILED MAY 3, 1904.

987,272.

Patented Mar. 21, 1911.

2 SHEETS—SHEET 2.



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MOTOR FOR TALKING-MACHINES.

987,272.

Specification of Letters Patent. Patented Mar. 21, 1911.

Application filed May 3, 1904. Serial No. 206,116.

To all whom it may concern:

Be it known that I, LOUIS P. VALIQUET, a citizen of the United States, and a resident of the city of New York, State of New York, have invented certain new and useful Improvements in Motors for Talking-Machines, of which the following is a full, clear, and complete disclosure.

The object of my invention is to generally improve the construction of talking machine motors, so that said motors will run with greater efficiency of power, decreased friction and for a greater length of time than has heretofore been made possible in machines of this class.

Briefly, my invention comprises a plurality of spring barrels and springs, which are so geared as to be wound by a single winding shaft, and which may, however, operate independently should one of said spring barrels become inoperative.

My invention also comprises an arrangement of certain gears and shafts so that the same may be removable without interfering with adjacent connecting parts.

My invention also comprises other improvements in the construction and arrangement of parts as will hereafter be more fully described and pointed out in the claims.

For a full, clear and exact description of this form of my invention, reference may be had to the following specification, and to the accompanying drawings forming a part thereof, in which—

Figure 1 is a central, vertical, sectional view of the motor mechanism showing the general arrangement of parts; Fig. 2, an end elevation of the same, showing that end of the motor to which the winding crank is applied; Fig. 3, an inverted plan view of the motor and its supporting plate; Figs. 4 and 5, detailed views of parts of the centrifugal governor for the motor; Figs. 6 and 7, perspective views of the pawl for locking the spring barrels; and Fig. 8, a transverse, sectional view of one of the spring barrels detached from the motor.

In the drawings the supporting plate 1, having the central recess in its upper surface, is preferably circular in outline and is adapted to be retained in a corresponding opening in the hinged cover of the motor casing in the usual manner.

The numeral 2 indicates the main spindle

or shaft upon which the turntable or record carrier is adapted to be secured in any suitable manner. The shaft 2 passes through the hollow sleeve 3, which depends from the recessed portion of the supporting plate 1 and is preferably integral therewith, and which is provided with interior bearings or bushings 4 and 5. The upper end of the bushing 4 is flanged at 6 and adapted to form a seat for the bearing balls 7, which receive the longitudinal weight of the shaft and table; suitable races being formed in the enlarged portion of the shaft 2, which is disposed within the recess in said plate 1, as indicated at 8, to receive the bearing balls 7. In this manner the spindle or shaft 2 and the parts carried thereby are mounted on an anti-friction thrust bearing, and said spindle provides a shoulder substantially in a plane with the plane of the upper surface of said plate for supporting the turn-table, not shown. The shaft 2 has rigidly attached to its lower end a sleeve 9, which carries two gears 10 and 11, the former of which is adapted to form a connection with the centrifugal governor, as will be more fully pointed out hereafter, and the latter of which will form a part of a train through which the power from the motor springs is transmitted. Also depending from the plate 1, are supporting posts 12 and 13. The post 12 carries at its lower end a suitable bearing or stud for the gear 14 which meshes with the gear or pinion 11, above mentioned. Upon the hub 15 of the gear 14 is also mounted a beveled pinion 16, which meshes with a beveled gear 17 fixed on the horizontal shaft 18. The shaft 18 has one end journaled in the post 12, as indicated at 19, while its opposite end is journaled in a removable bearing block 20, carried by the post 13, and adjustably held therein by means of the screw 21. The shaft 18 also carries a pinion 22 which is fixed thereto, and which is adapted to mesh with two large gears 23 and 24, which gears are carried respectively by two parallel, horizontal shafts 25 and 26, which are supported in suitable bearing posts, as indicated at 27. The shafts 25 and 26 also carry spring barrels 28 and 29, which are connected with the gears 30 and 31 respectively. The gears 30 and 31, and internal construction of the spring barrel, will be hereafter more fully described. The gear

30 and 31 are adapted to mesh with the pinion 32 which is mounted on a short winding shaft 33; said winding shaft being slotted to receive the key of the usual winding crank, as indicated at 34. The shaft 33 also carries the pawl for holding the gears 30 and 31 in position when the springs are not being wound. This pawl comprises a plate or disk like support 35, which has two projecting arms 36 and 37, which terminate in gear teeth 38 and 39. The arms 36 and 37 are offset, so that when the support 35 is in place upon the shaft 33, with its face in contact with one side of the pinion 32, said arms will come opposite the gears 30 and 31, so that the sets of teeth 38 and 39 will mesh respectively with the teeth of the gears 30 and 31, when the gear 32 is moved in an anti-clock-wise direction, as in Fig. 6. For forcing the pawl support 35, in contact with the pinion 32, I provide a helical spring 40, which is confined in its position upon the shaft 33, by means of a collar or a similar device 41.

It will be seen that the frictional contact between the pawl support 35 and the pinion 32, will cause the teeth of the pawl to be disengaged from their respective gears when the shaft is turned in one direction, and said pawl will reengage said gears when said shaft is turned in the opposite direction. Thus a noiseless and positively acting, holding device is provided for the gears 30 and 31, when the motor springs are not being wound. The movement of the pawls 36 and 37 is limited by a suitable stop, such as a pin 42, depending from the supporting plate 1. This stop gives just sufficient play to the pawls to allow the gears to be rotated without contacting with the same when the pinion 32 is turned in one direction, but so that said gears will be immediately reengaged by the pawls when the pinion is rotated in the opposite direction.

The centrifugal governor used with this form of spring motor is similar to that described and claimed in my prior application filed October 1, 1903, Serial No. 175,302, and is applied in the following manner:—The shaft 33 being supported in suitable hangers or posts 43 and 44, the post 44 of which has a lateral projection 45 which carries a bearing plate 46 for the shaft 47 of the centrifugal governor. The shaft 47 is supported at its other end by a post 48, which also depends from the plate 1. Said shaft 47 has, adjacent one end thereof, a screw-thread or worm gear 49, which meshes with the gear 10, and adjacent which is a fixed collar 50. Adjacent the other end of said shaft 57 is a slidable sleeve 51, which carries at its outer end a circular disk 52. The inner end of the sleeve 51 is provided with a pair of slots or recesses 53, which engage a transverse pin 54 on the shaft 47,

said pin and slot forming a coupling between the sleeve 51 and the shaft 47. The sleeve 51 is connected with the collar 50 by means of spring strips 55, which carry the ordinary governor balls or weights 56. A coiled spring 57 surrounds the shaft 47 between the collar 50 and the sleeve 51, and tends to force the latter outwardly with the disk 52. The disk 52 is adapted to contact with brake shoes or pads 58, which are carried upon a semi-circular yoke 59, which is fixed upon a horizontal shaft 60, having bearings in the hanger or support 61 and the post or hanger 27. Said shaft 60 is provided with a coiled spring 62, one end of which engages the neck of the yoke 59, and the other end of which is held by the plate 1. The yoke 59 and the pads 58 are, therefore, kept under spring tension by a pressure in the direction of the disk 52. The outer end of the shaft 60 is curved or bent, as shown at 63, and carries upon its end a collar 64, which has an inclined surface on its lower side. Passing through an opening in the plate 1, is a pin 65, having a milled head, and which is provided on its lower end with a suitable stop 66, which is adapted to bear on the under side of the collar 64, which surrounds said pin. It will be seen by this construction of the governor and regulator that as the milled head of the pin 65 is turned so that the stop 66 travels from a narrow portion to a wide portion of the collar 64 on the inclined surface, the brake pads or shoes 58 will be retracted from the brake disk 51, and the motor be allowed to run at a greater speed. The opposite turn of the pin 65 will produce the opposite effect.

The construction of the driving spring and the spring barrel comprises the following arrangement of parts:—The spring barrel 28 consists of a metallic drum which is open at one end and is attached at said end to the gear 30 by means of screws or other suitable devices 67. Said gear 30 and the spring barrel 28 are respectively mounted for rotation on the reduced opposite ends of the barrel arbor or sleeve 68 which is adapted to turn in said parts. The driving spring 69 is attached at one end, as indicated at 70, to the barrel arbor or sleeve 68, and its opposite end is attached to the spring barrel, as indicated at 71. The end of the barrel arbor is provided with suitable recesses 72, which are adapted to engage corresponding projections, or keys, on the shafts 25 and 26, the spring barrels for each shaft being identical in construction. The slot or recess in the end of the barrel arbors and the coöperating keys or projections on the shaft together form a coupling between the barrel and shaft and afford a means whereby the said barrel may be detached from the shaft without disturbing the rest of the motor as is again referred to below.

In assembling the device, the spring barrels are placed upon the shafts 25 and 26, so that the recesses 72 engage their corresponding keys, and thumb-nuts 73 are then
 5 screwed upon the ends of said shafts to hold the barrel arbors carrying the spring barrels in position thereon. Since both of the
 10 gears 30 and 31 mesh with the pinion 32, either one of the driving springs are effective to drive the motor independently of the
 other, and should one become broken the motor will be driven by the remaining
 spring, until a new one is provided in place of the broken one. When it is desired to
 15 substitute a new spring and spring barrel for one which has been rendered inoperative in any manner, it is only necessary to allow
 the motor to run down to release the tension on the springs, after which the spring barrels
 20 may be easily removed from their shafts, after simply unscrewing the thumb-nuts 73.

From the construction of parts above described, it will be seen that I have provided
 25 an exceedingly simple and efficient form of motor, in which the parts are easily removable and interchangeable, while at the same
 time the parts are compact without being inaccessible from the under side of the
 30 motor, when the cover of the motor casing is in its raised position. Furthermore, by
 having the inner end of the driving spring attached to the barrel arbor, the gears 30
 and 31 are not active except in winding the motor, which greatly reduces the amount of
 35 friction over the construction where the spring is wound from its inner end and the
 outer end used to drive the motor.

Having just described my invention, it will be obvious that certain changes may be
 40 made in the form and arrangement of parts, and different mechanical equivalents may be
 used without departing from the spirit and scope of my invention, but

45 What I claim and desire to protect by Letters Patent of the United States, is—

1. In a talking machine motor, the combination with the main driving spindle, a
 50 bearing sleeve therefor, a ball thrust bearing located at the upper end of said sleeve
 and gears carried by said spindle adjacent the lower end of said sleeve, a centrifugal
 governor, power mechanism and gearing connecting said power mechanism with one
 55 of said gears, the other of said gears being connected with the centrifugal governor.

2. In a talking machine motor, the combination with the main driving spindle, of
 60 a bearing sleeve therefor, a ball thrust bearing adjacent the upper end of said sleeve, a
 sleeve carried by the lower end of said spindle having two gears located thereon,
 a centrifugal governor, power mechanism, and a power transmitting train, which con-
 65 nects with one of the gears on said sleeve,

the other of said gears being connected with the centrifugal governor.

3. In a motor, a supporting plate, a sleeve depending therefrom, a spindle supported in
 said sleeve, a ball thrust bearing in unitary
 70 relation with said spindle supported by said plate, a governor, and driving mechanism
 suitably geared to said spindle.

4. In a motor, a driving spindle suitably
 75 suspended and having a sleeve secured to its lower end, said sleeve being provided with
 a plurality of gears integral therewith, a governor operated by one of said gears and
 driving mechanism connected with another of said gears. 80

5. In a motor, a supporting plate provided with a dished portion, a driving spindle
 rotatably suspended from said plate in
 said dished portion, said spindle having an
 85 annular shoulder thereon bearing on said plate below the plane of the upper surface
 of said plate, a governor, and driving mechanism suitably geared to said spindle.

6. In a motor, a supporting plate provided
 90 with a recess in its upper surface, a driving spindle rotatably suspended from said plate
 and having an enlarged portion located within said recess and bearing on said plate
 below the plane of the upper surface of said
 95 plate, a governor, and driving mechanism suitably geared to said spindle.

7. In a motor, the combination with a rotary
 spindle having its opposite ends free, of a ball thrust bearing intermediate of the
 ends of said spindle, a sleeve having gears
 100 mounted on said spindle local to one end thereof, a governor, driving mechanism, and
 gearing connected to said governor through the gears on said spindle and arranged to
 rotate said spindle. 105

8. In a motor, a supporting plate provided
 with a recess in its upper surface, and a
 driving spindle having an annular portion
 with a ball thrust bearing on said plate, the
 110 upper face of said enlarged portion being substantially in a plane coincident with the
 plane of the upper surface of said plate, a governor, and driving mechanism suitably
 geared to said spindle.

9. In a spring motor for talking machines,
 115 a plurality of driving springs, winding gear connected with said driving springs,
 a winding pinion meshing with the said gears, and a double pawl in frictional contact
 with said pinion and adapted to en-
 120 gage said gears when said pinion is rotated in one direction and to be disengaged from
 said gears when said pinion is rotated in the opposite direction, and means for rotating
 said pinion. 125

10. In a spring motor for talking machines, a plurality of driving springs, wind-
 ing gears connected with said driving
 130 springs, a winding pinion with which said gears mesh, a part adapted to frictionally

engage said pinion, said part having a plurality of arms terminating in teeth adapted to engage each of said gears, and means for rotating said pinion.

11. In a spring motor for talking machines, a plurality of driving springs, winding gears connected with said driving springs, a pinion with which said gears are adapted to mesh, a part in frictional engagement with said pinion having a plurality of arms terminating in teeth adapted to engage said gears, a spring for keeping said part in contact with said pinion and means for rotating said pinion.

12. In a talking machine motor, the combination with a pair of driving shafts, of a spindle geared to said shafts, spring driving mechanism on each of said shafts provided with winding gears, a single winding shaft for simultaneously winding the spring driving mechanism on said respective shafts, and means frictionally actuated by the rotation of said winding shaft, and carried thereby, operative to engage said gears when said winding shaft is rotated in one direction and to disengage said gears when said winding shaft is rotated in the opposite direction.

13. In a motor, a driving shaft, driving mechanism for said shaft, gears mounted in a common plane and actuated by said driving mechanism, a pinion connecting said gears, a shaft for said pinion, and a double-ended pawl arranged to be shifted to engage each of said gears by frictional engagement with said pinion when rotated in one direction and frictionally shifted by said pinion to disengage said gears when rotated in the opposite direction.

14. In a motor, a pair of parallel driving shafts, winding gears mounted thereon, a winding shaft provided with a pinion meshing with said winding gears and an annular disk mounted on said winding shaft and held in frictional contact with said pinion, said annular disk being provided with radially extending arms forming pawls engaged with said winding gears.

15. In a motor, a driving spring, a winding gear connected with said spring, a winding shaft, a pinion mounted on said winding shaft and meshing with said gear, a pawl loosely supported on said shaft and frictionally engaging said pinion and having a plurality of teeth operative to be moved into and out of mesh with the teeth of said gear by said pinion, and means for limiting the movement of said pawl away from said gear.

16. In a talking machine motor, the combination with a main driving spindle, of a supporting plate therefor, a thrust bearing located upon the outer side of said plate, gears carried by the free end of said spindle, a centrifugal governor, power mechanism, and gearing connecting said power mechanism

with one of said gears, the other of said gears being connected with the centrifugal governor.

17. In a talking machine motor, the combination with the main driving spindle, of a supporting plate therefor, a thrust bearing adjacent the outer side of said plate, a sleeve carried by the inner free end of said spindle having two gears located thereon, a centrifugal governor, power mechanism and a power transmitting train which connects with one of the gears on said sleeve, the other of said gears being connected with the centrifugal governor.

18. In a talking machine motor, the combination with a supporting plate, of a main driving shaft rotatably mounted therein, a pair of parallel shafts rotatably supported upon said plate, a gear loosely mounted upon one end of each of said shafts, and a spring connection between each gear and its shaft, a winding gear meshing with both of said gears, and means to lock said gears in a fixed position, gears upon the opposite ends of said shafts rigidly secured thereon, a pinion intermeshing with said last mentioned gears, a shaft carrying said pinion and rotated thereby, a governor and means between said last mentioned shaft and said governor and between said last mentioned shaft and said main driving shaft for driving the same.

19. In a motor, the combination with a rotatable driving shaft, of a sleeve slidably mounted thereon, said sleeve having reduced ends, a gear mounted upon one of said reduced ends and rotatable with respect thereto, and having a cylindrical boss, a spring barrel secured to said boss and journaled upon the other of said ends, and a spring having its opposed ends respectively secured to said barrel and said sleeve.

20. In a talking machine motor, a pair of driving shafts, a spindle geared to said shafts, a spring driving mechanism on each of said shafts provided with winding gears, a single winding shaft, a pinion rigidly mounted upon said shaft for simultaneously winding both spring driving mechanisms, a pawl engaging said winding gears and comprising two oppositely projecting arms loosely mounted upon said winding shaft and engaging against the side of the said pinion, and yielding means to hold said pawl in frictional engagement against the side of said pinion, whereby said winding shaft is free to be rotated in one direction to wind up the spring driving mechanism, said pawl being inoperative during said winding movement, but being automatically thrown into engagement to prevent the unwinding of the said winding pinion.

21. In a talking machine motor, a pair of parallel driving shafts, a bearing for each

shaft, the end of each shaft extending freely outwardly from its bearing, a spring driving mechanism mounted upon the free end of each shaft, a retaining member to
 5 hold each driving mechanism in position, spring winding mechanism for said spring driving mechanisms and a single winding shaft for simultaneously operating both
 10 said mechanisms, and extending outwardly in the direction of, and parallel to the free ends of said driving shafts, said driving mechanisms being freely removable from
 15 said driving shafts upon the removal of said retaining members.

22. In a motor, a driving shaft suitably mounted, a sleeve rigidly secured on said shaft, a gear loosely journaled on said sleeve independent of said shaft, a spring casing
 20 connected with said gear, a coiled spring secured at its outer end to said spring casing and at its inner end to said sleeve.

23. In a motor, a driving shaft suitably mounted, a sleeve mounted on said shaft
 25 and interlocked therewith, a winding gear and a spring casing rotatably mounted to rotate on said sleeve independent of said shaft, and a coiled spring in said casing having its outer end secured to said casing
 30 and its inner end secured to said sleeve.

24. In a motor, the combination with a rotary spindle, of a ball thrust bearing intermediate of the ends of said spindle, a plurality of gears carried by said spindle, a
 35 stationary bearing sleeve embracing said

spindle intermediate of said gears and said bearing, and forming a bearing for said spindle, a governor, driving mechanism, and gearing connecting said driving mechanism with said governor through the gear-
 40 ing on said spindle, to contemporaneously actuate said spindle and governor.

25. In a motor, a driving shaft rotatably supported on spaced hangers and having a free end extending beyond said hangers, a
 45 sleeve mounted on said free end, means for rigidly connecting said sleeve to said shaft, a winding gear loosely mounted on said sleeve, and a coiled spring having its outer end secured to said gear and its inner end
 50 secured to said sleeve.

26. In a motor, a driving shaft rotatably supported on spaced hangers and having a free end extending beyond said hangers, a sleeve mounted on said free end, means for
 55 rigidly connecting said sleeve to said shaft, said means comprising interlocking elements between the inner end of said sleeve and said shaft and means for holding said elements in engagement with each other, a
 60 winding gear loosely mounted on said sleeve, and a coiled spring having its outer end secured to said gear and its inner end secured to said sleeve.

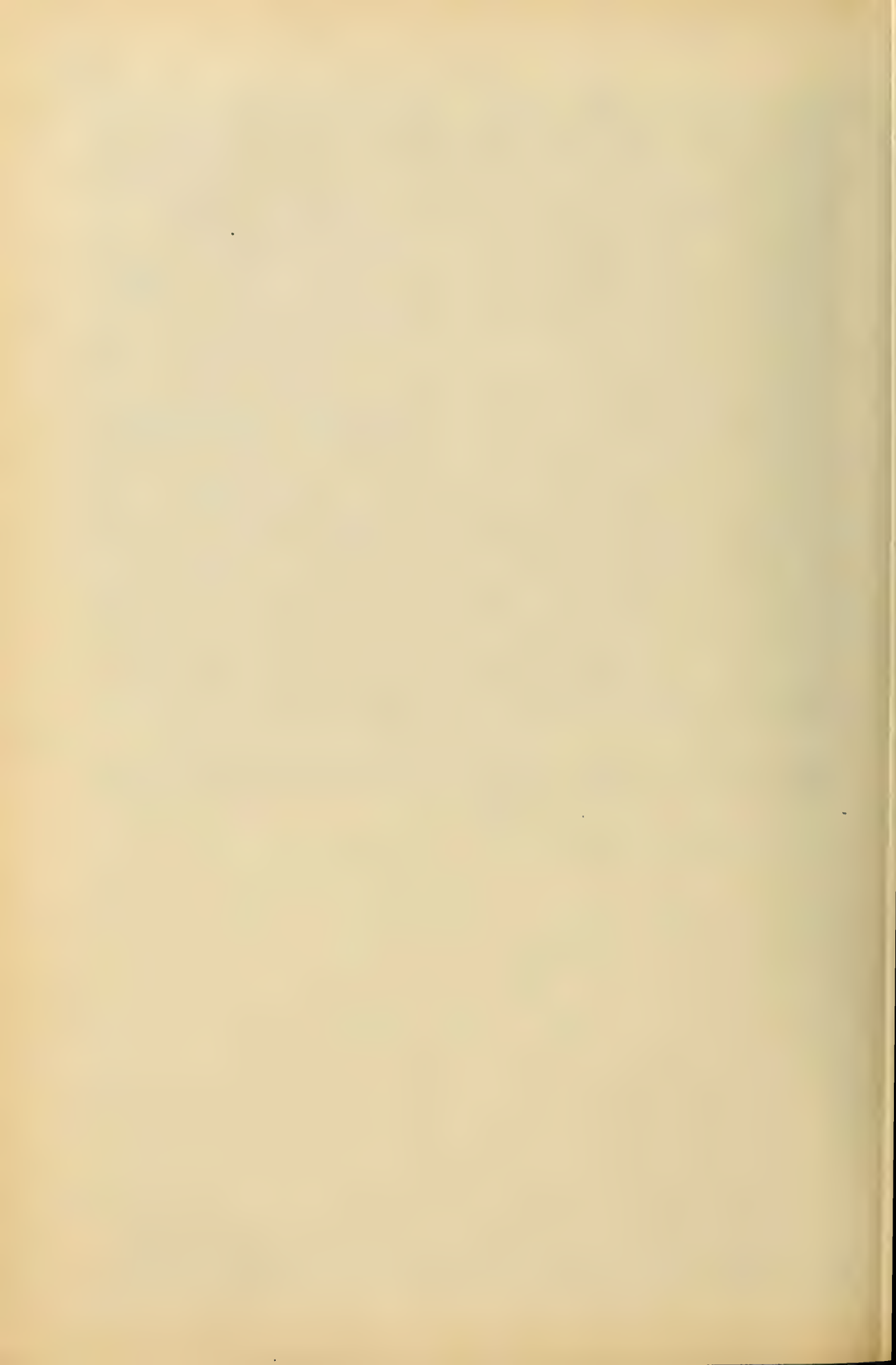
In witness whereof I have hereunto set
 65 my hand this 30th day of April, A. D. 1904.

LOUIS P. VALIQUET.

Witnesses:

ADOLF SCHMINCKE.

FRANK G. SWARTWOUT.



989, 921

A. FISCHER.
SOUND BOX FOR TALKING MACHINES.
APPLICATION FILED JULY 1, 1909.

989,139.

Patented Apr. 11, 1911.

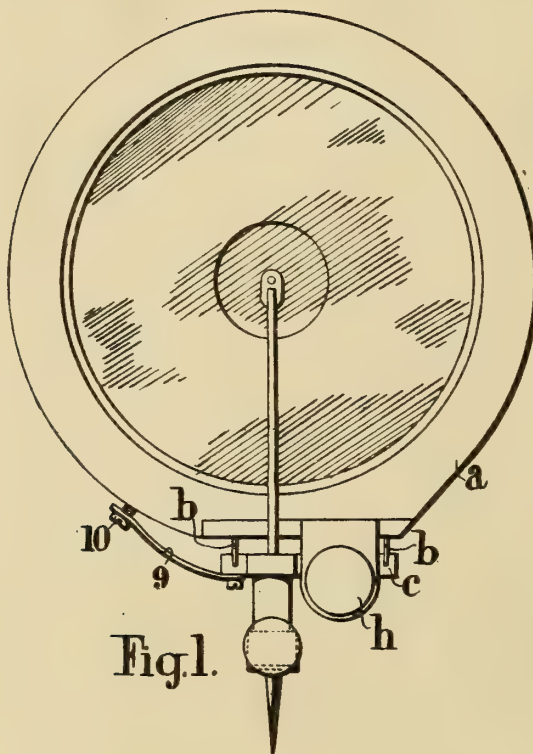


Fig. 1.

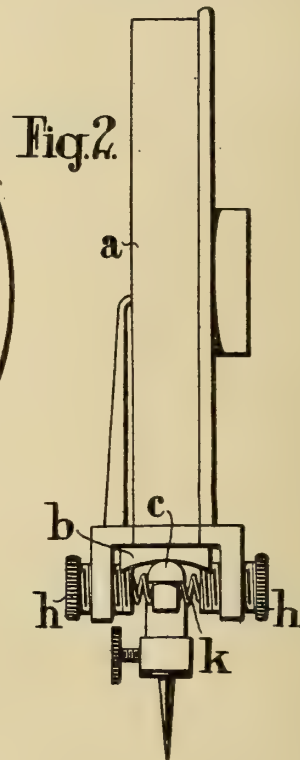


Fig. 2.

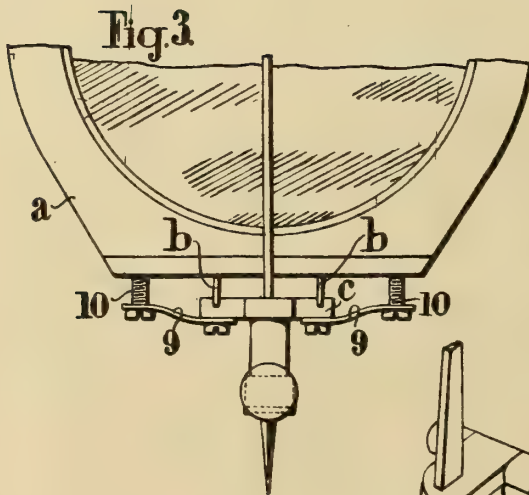


Fig. 3.

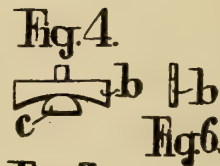


Fig. 4.

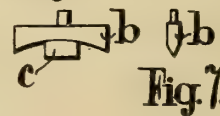


Fig. 5.

Fig. 6.

Fig. 7.

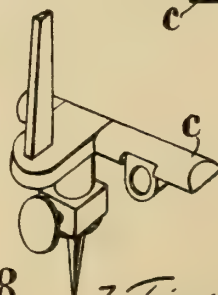


Fig. 8.

Witness
F. R. Fulton
J. S. Gustaf

Inventor
Alex. Fischer

By William J. M. M. M.

his atty.

UNITED STATES PATENT OFFICE.

ALEX FISCHER, OF KENSINGTON, LONDON, ENGLAND.

SOUND-BOX FOR TALKING-MACHINES.

989,139.

Specification of Letters Patent. Patented Apr. 11, 1911.

Application filed July 1, 1909. Serial No. 505,472.

To all whom it may concern:

Be it known that I, ALEX FISCHER, a subject of the King of England, residing at 8 Maclise road, Kensington, in the county of London, England, have invented certain new and useful Improvements in Sound-Boxes for Talking-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to bearings for mounting a stylus on sound boxes of talking machines, and has for its object the improvement of the bearings and coating parts described in my former Patent Number 904,523, November 24, 1908, sound boxes for talking machines.

To these ends the invention consists in the details of construction and novel combinations of parts more fully hereinafter disclosed and particularly pointed out in the claim.

In my former patent above, the spindle *c* is mounted in brackets *b* provided with bearing surfaces concentric with the curved portion of said spindle *c* and the centers of which lie within said spindle. In the present improvement, however, I substitute for these other curved surfaces with their centers outside of the spindle *c*, as will appear below.

Referring to the accompanying drawings forming a part of this specification in which like letters refer to like parts in all the views:—

Figure 1, is a front elevational view of a sound box with my improvement applied thereto: Fig. 2 is a side elevational view of the parts shown in Fig. 1; Fig. 3, shows a modified form of construction according to the present invention; Figs. 4 to 7 show details of the bearings hereinafter referred to; and, Fig. 8, shows a perspective view of the stylus and associated parts.

a is the shell of the sound box provided with guide bearings *b*. It will be observed from Figs. 1 to 7 that these bearings are of concave form, and are a small segment of a circle.

c is the spindle bearing which, as in the patent above, may be circular or partly circular in cross section.

In Figs. 2 and 4 the radius of curvature of the spindle is smaller than the radius of curvature of the guide bearing surface *b*,

while in Fig. 5 the radius of curvature of the spindle *c* is the same as that of the guide bearing surface *b*, but in each case the center of the circle, of which the bearing surface *b* is the circumference instead of falling within said spindle *c*, falls considerably outside the same.

k shows spiral controlling springs and *h* shows hollow nuts. 9 is a flat spring preferably attached by a screw to the side of the spindle *c* opposite the bearing surface, the other end being slotted and having a screw passing through such slot into the shell *a* of the sound box.

Referring now to the form shown in Fig. 3, which is intended more especially for the construction of a cheaper sound box than that described, in this case the springs *k* hollow nuts *h* and brackets *g* shown in Fig. 2 of the drawings of the patent above, are dispensed with, and in their place a second flat spring 9 is attached to the side of the spindle *c* opposite its bearing surface as seen on the left of Fig. 3.

Referring to the details shown in Figs. 6 and 7 which are edge views of two forms of guide bearings *b*, the guide bearing shown in Fig. 6 is made of a thin plate, while the guide bearing in Fig. 7 is made with a beveled bearing also.

From the construction now disclosed, it will be evident since the centers of curvature of the bearings *b* and *c* fall outside of the spindle *c*, that not only will all the freedom of motion be permitted that is possessed by the corresponding structure of my patent above, but in addition to such motion the present structure enables the spindle *c* to have a slight sidewise movement in the bearing *b*. In other words said spindle may, in a sense, be considered as constituting the fulcrum of a bent lever, one end of one arm of which terminates in the needle point and the end of the other arm of which is connected to the stylus bar. Further, the bearing *b*, therefore, enables the spindle *c* constituting the fulcrum of this lever to be laterally shifted, and to move against the push of the springs and the pull of the diaphragm under the stresses imparted by the traveling record.

It is further evident that the structure in the patent above would be unsuitable to permit this lateral shifting of the fulcrum so long as the centers of curvature of the bearings lie with the spindle *c*. It is also evi

dent, if the bearing surface of the part *b* is made straight, too much play will be allowed the spindle *c*. In practice I have found a
5 convenient length of radius for the curvature of the said bearing to be about equal to the length of the lever above, although, of course, this may be varied without destroying the beneficial effects of the invention.

10 What I claim is:—

In a talking machine, the combination of a casing; a diaphragm in said casing; a pair of concavely curved guide bearings rigid with said casing; a spindle provided with
15 curved guide bearings adapted to contact

with said first mentioned bearings, the center of curvature of each of said first mentioned bearings being located outside of said spindle, and the radius of curvature of said spindle being less than the radius of curvature of said first mentioned bearings; and a stylus bar attached to said diaphragm and spindle, substantially as described.

In testimony whereof, I affix my signature, in presence of two witnesses.

ALEX FISCHER.

Witnesses:

LILY SIMMONDS,
A. E. VIDAL.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

M. GRAFT.
 AUTOMATIC MAGAZINE NEEDLE HOLDER.
 APPLICATION FILED JUNE 16, 1910.

989,544.

Patented Apr. 11, 1911.

Fig. 1

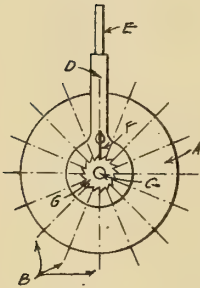


Fig. 2

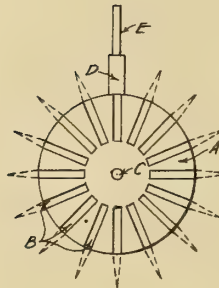


Fig. 3

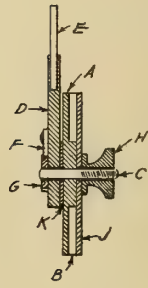
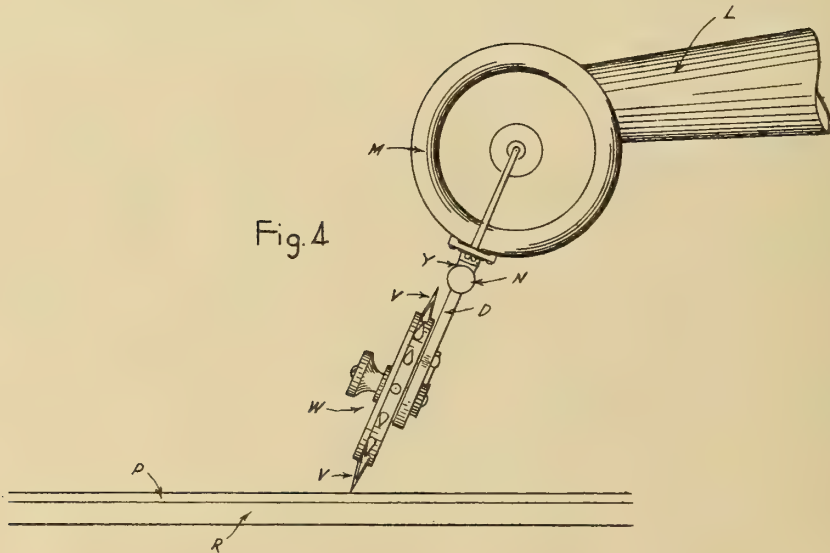


Fig. 4



WITNESSES:

Samuel Davis
Walter R. Jones

Max Graft,
 INVENTOR.

UNITED STATES PATENT OFFICE.

MAX GRAFT, OF PHILADELPHIA, PENNSYLVANIA.

AUTOMATIC MAGAZINE NEEDLE-HOLDER.

989,544.

Specification of Letters Patent. Patented Apr. 11, 1911.

Application filed June 16, 1910. Serial No. 567,225.

To all whom it may concern:

Be it known that I, MAX GRAFT, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a certain
5 new and useful improvement in a certain automatic magazine needle-holder to be used in disk talking-machines in applying a new method of using needle after needle
10 without removing the same immediately after playing a record.

The invention applies to all disk talking machines and consists of a multiple revolving needle holder mounted on a supporting arm by which attachment is made to the re-
15 producer of the talking machine.

The whole contrivance operates in such a way as to allow all the needles to be used consecutively and afterward removed all at one time, and others put in their place.
20 This device may be made of gun metal, aluminum, brass, iron, steel, nickel or other material or materials.

Figure 1 represents a rear elevation. Fig. 2 a front elevation with outer plate and
25 thumbscrew removed. Fig. 3 represents a central section and Fig. 4, is an assembly of all the parts showing the connection with the reproducer M of the machine, as the device would appear in actual use with nee-
30 dles in place resting upon the record P which is supported on the turntable R.

This device consists of a supporting arm D Figs. 1-2 and 3 on which is mounted two circular plates A and J Fig. 3, separated
35 from the supporting arm D by a washer K Fig. 3 to prevent the rubbing of the lower plate A and the supporting arm D. These two plates A. and J revolve upon a pin C Figs. 1-2 and 3 through their center and are
40 clamped together by means of a thumbscrew H Fig. 3 which works in and out on a thread cut in the outer end of the pin or axle C. This pin or axle passes through the supporting arm D Figs. 1 and 3 and mounts
45 on its inner end a toothed wheel G Figs. 1 and 3 which operates against a dog F Figs. 1 and 3 so as to form a ratchet. The central pin or axle C is made to revolve freely through the supporting arm D and
50 outer or cover plate J as shown in Fig. 3 but is fast in the lower disk or plate A and the ratchet wheel G. The inner circular plate or disk A Figs. 1-2 and 3 is slotted or grooved as shown at B Figs. 2 and 3 on
55 lines radiating from its center to such a

width and length as to properly accommo-
date the metallic needle now used in the
playing of disk talking machine records.
These needles as shown dotted in Fig. 2 are
held firmly in place by means of the outer
60 cover or clamp plate J Fig. 3 which is circular and of the same diameter as the inner magazine plate A Fig. 3 and is held against it by means of a thumbscrew H, Fig. 3 operating on a screw thread cut in the central
65 pin C as shown in Fig. 3.

On the outer surface of the cover plate J a star or other mark is made to provide a starting point so that none of the needles
70 may be used a second time. When the thumbscrew H Fig. 3 is turned so as to jam the two plates A. and J together and thus firmly secures the needles in the pockets or
75 grooves of the plate A additional rotary pressure on the thumbscrew in a clockwise direction will cause each needle to consecutively assume a vertical position and ready
80 for playing, being so controlled by the ratchet arrangement G and F Fig. 3. A reverse motion of the thumbscrew releases the cover plate J, thus enabling the needles
to be removed and the magazine refilled again.

The whole contrivance may be attached to the reproducer M Fig. 4 by inserting a pin
85 E Figs. 1-2 and 3 (which is made fast to the supporting arm D Fig. 3) in the screw or needle clamp of the reproducer as shown at Y and X Fig. 4. The pin at the end of the supporting arm inserted in the needle or
90 screw clamp of the reproducer can be round, square or any other shape.

Slight modifications might be made in the construction here shown without departing
95 from the spirit of my invention, and I therefore do not wish to be limited to its exact construction.

What I claim is:—

1. A device of the class recited comprising a fixed support, a rotatable disk-like member
100 equipped with a plurality of radially disposed detachable needles, means for clamping said needles with respect to the said member and means for preventing retrograde movement of said member.

2. A device of the class recited comprising a fixed support, a disk-like member provided
105 with a plurality of radially extending groove, rotatably mounted with respect to said support, needles for said grooves, means

for clamping said needles within said grooves and means for preventing retrograde movement of said member.

5 3. A device of the class recited comprising a fixed support, a disk-like member provided with a plurality of radially disposed grooves rotatably mounted with respect to said support, a needle within each groove, a removable plate for preventing the escape of the needles, means for clamping the plate to place and means for preventing retrograde movement of said member.

10 4. A device of the class recited comprising a fixed support, a pin having a screw-threaded end extended therefrom and free to rotate with respect thereto, a disk-like member rotatable with said pin, said member be-

ing provided with a plurality of radially disposed needle receiving grooves, needles for said grooves, a plate for preventing the escape of said needles, a thumb-screw for clamping the plate to the said member whereby said member may be rotated clockwise by said thumb-screw and means operatively connected between said support and member for preventing retrograde movement of said member. 20 25

In witness whereof I have hereunto fixed my signature in the presence of two subscribing witnesses.

MAX GRAFT.

Witnesses:

E. M. SAMPSON,

JOS. F. SCHULTZBACH.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

222.87

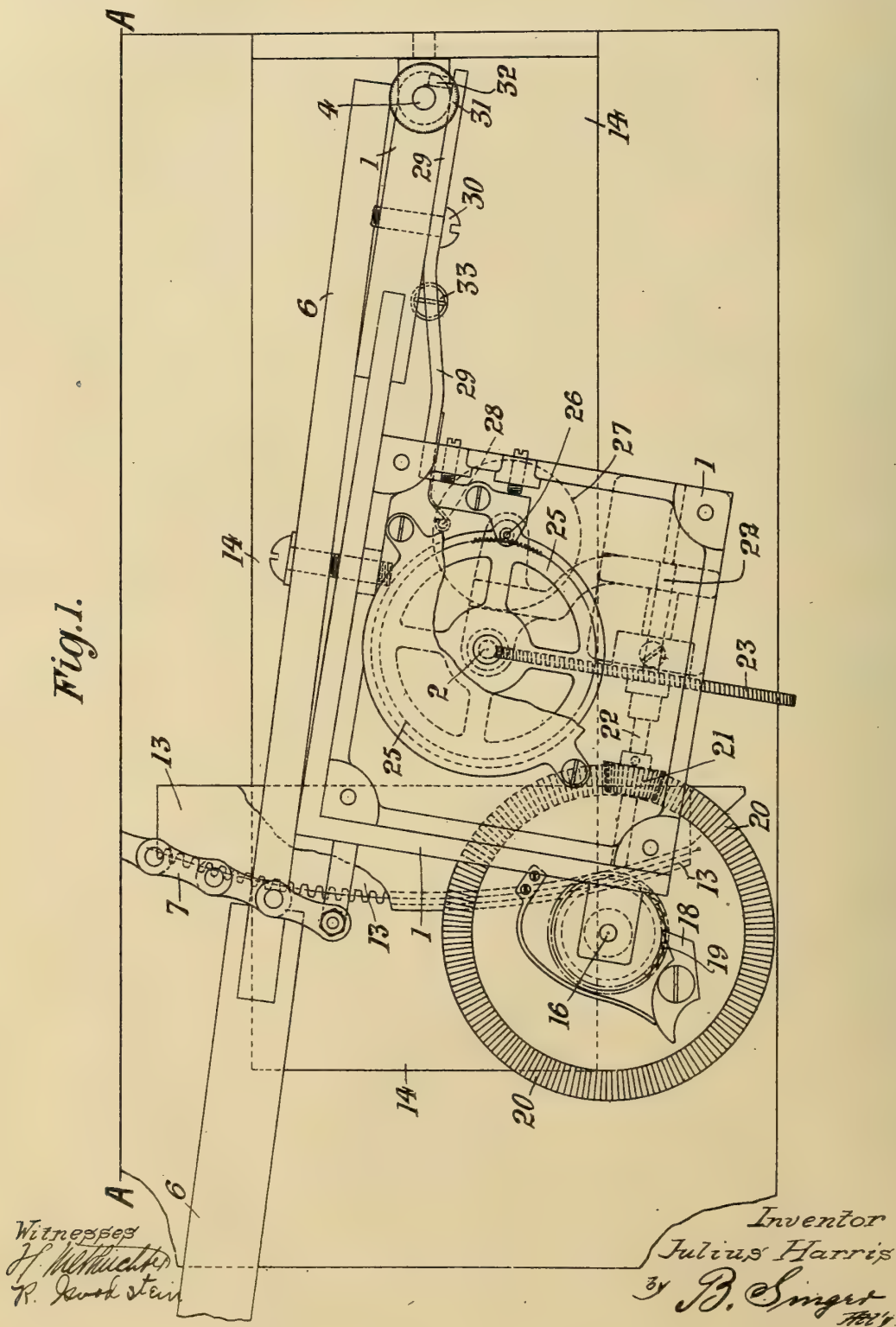
J. HARRIS.
SOUND RECORDING AND REPRODUCING MACHINE.
APPLICATION FILED SEPT. 2, 1909.

989,707.

Patented Apr. 18, 1911.

5 SHEETS—SHEET 1.

Fig. 1.



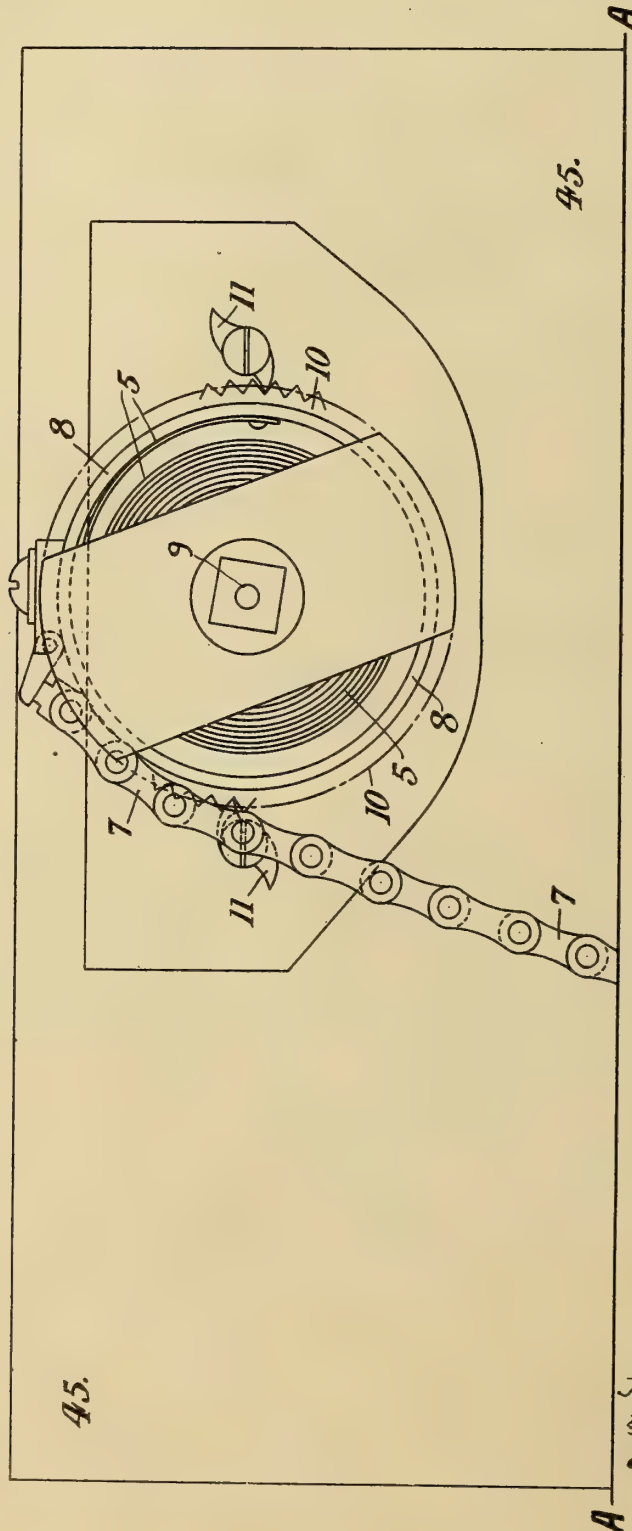
J. HARRIS.
SOUND RECORDING AND REPRODUCING MACHINE.
APPLICATION FILED SEPT. 2, 1909.

989,707.

Patented Apr. 18, 1911.

5 SHEETS—SHEET 2.

Fig. 1A



Witnesses
H. Mettlicher
R. Kroschke

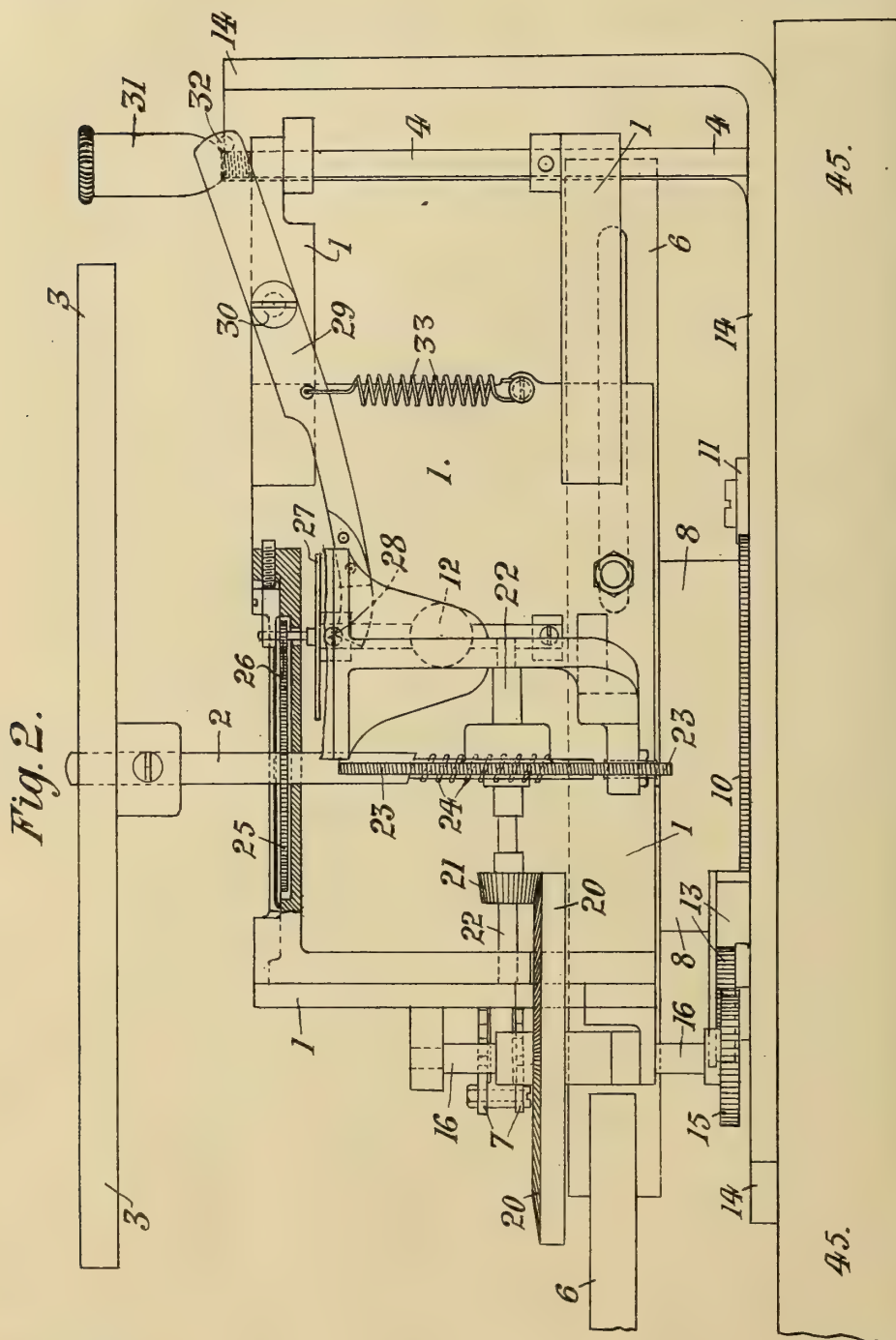
Inventor
Julius Harris
by *B. Singer*
H. H. H.

J. HARRIS.
SOUND RECORDING AND REPRODUCING MACHINE.
APPLICATION FILED SEPT. 2, 1909.

989,707.

Patented Apr. 18, 1911.

5 SHEETS—SHEET 3.



Witnesses
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SOUND RECORDING AND REPRODUCING MACHINE.
APPLICATION FILED SEPT. 2, 1909.

989,707.

Patented Apr. 18, 1911.

5 SHEETS—SHEET 4.

Fig. 3.

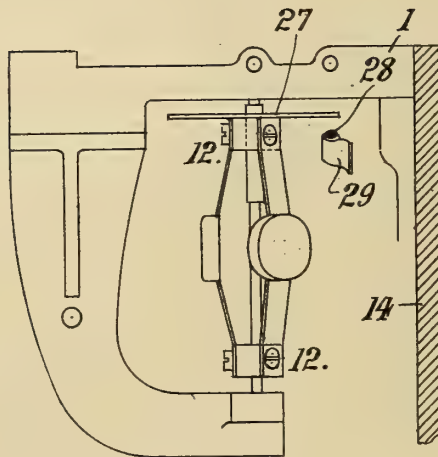


Fig. 4.

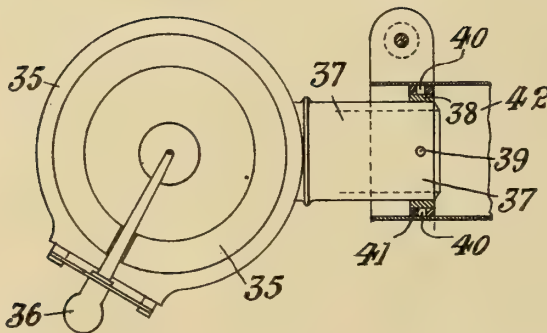
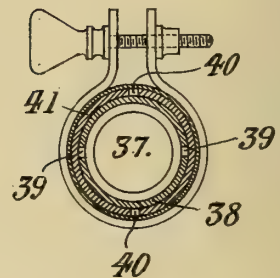


Fig. 5.



Witnesses
H. M. Huetter
R. Rookstein

Inventor
Julius Harris
by *B. Singer*
Att'y

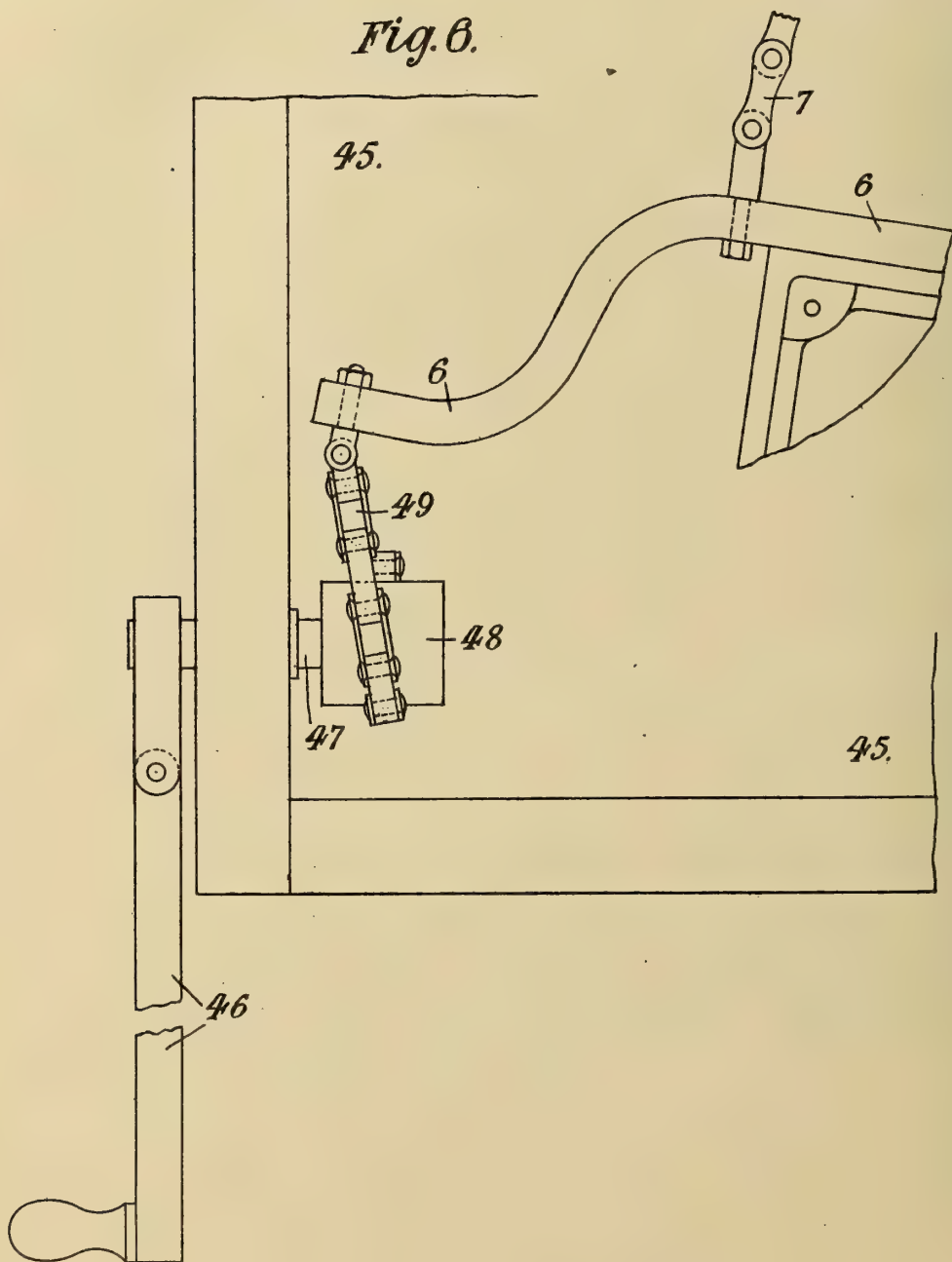
J. HARRIS.
SOUND RECORDING AND REPRODUCING MACHINE.
APPLICATION FILED SEPT. 2, 1909.

989,707.

Patented Apr. 18, 1911.

5 SHEETS—SHEET 5.

Fig. 6.



Witnesses
H. M. H. H. H.
R. Jacobson

Inventor
Julius Harris
by *B. Singer*
H. H. H.

UNITED STATES PATENT OFFICE.

JULIUS HARRIS, OF LIVERPOOL, ENGLAND, ASSIGNOR OF ONE-HALF TO THOMAS KING EMERY, OF LISCARD, ENGLAND.

SOUND RECORDING AND REPRODUCING MACHINE.

989,707.

Specification of Letters Patent.

Patented Apr. 18, 1911.

Application filed September 2, 1909. Serial No. 515,960.

To all whom it may concern:

Be it known that I, JULIUS HARRIS, a subject of the King of England, residing at Liverpool, in the county of Lancaster, England, have invented a new and useful Sound Recording and Reproducing Machine, of which the following is a specification.

This invention has reference to phonographs, gramophones, and other similar auto-musical instruments, and instruments driven by spring motors, and especially those in which the records are of the disk type, and the general object of the invention has been to provide improvements in connection with such instruments by which they are more easily worked and at the same time the mechanism is simple, inexpensive, and effective, and capable of giving uniform and reliable results or effects, both in the taking of records, and in playing them.

This invention will be described with the aid of the accompanying drawings, which illustrate an auto-musical instrument of the character herein referred to, and in which the improvements hereunder are comprised.

In these drawings, Figure 1 is a plan of one part, and Fig. 1^A a plan of the other part of the improved mechanism, and Fig. 2 is an elevation partly in section of the improved mechanism. Figs. 3, 4, and 5 are details hereinafter described, and Fig. 6 shows a part of the hand actuating means.

1, generally designates a rocking frame; 2 is a spindle on which the record table 3 is mounted; 4 is a pivoted spindle on which the frame 1 is mounted and about which it rocks; and 5 is the usual spring motor which is wound up by the movement of the frame.

The frame 1 has connected with it a lever 6, which is actuated by hand in the manner hereinafter described; and the frame is connected with the spring motor 5 by a chain 7, one end of which is connected up with the frame itself, and the other with the case 8 of the spring motor 5; while one end of the spring is connected to the case, and the other with an arbor 9, which has fixed on it a toothed pawl wheel 10, which is held against rotation in one direction by the pawls 11.

The frame 1 carries gearing by which motion is imparted to the records disk and the

mechanism connected with the same through a fixed curved rack 13, which is attached to the carrier bed 14 of the machine, and is held stationary thereon. This rack serves to operate the gearing carried by the frame 1, through a part of the said gearing engaging with such rack and being caused to travel over it by the spring motor 5 which is connected with the frame 1 by the chain 7.

The gearing carried by the frame comprises a tooth wheel 15 which engages with the curved rack 13, and as the frame is moved by the spring motor 5 through the chain 7, the tooth wheel 15 is rotated by the teeth of the curved rack 13, and the spindle 16 of the tooth wheel also rotated, and such rotation of the spindle 16 is transmitted to the bevel wheel 20 through the medium of a ratchet wheel 19 fixed to the spindle 16 and a spring pressed pawl 18 attached to the wheel 20, and which engages with the teeth of the said ratchet wheel 19.

The ratchet wheel 19 and spring pressed pawl 18 are provided for the purpose of enabling the spring motor 5 being wound without operating the gearing, that is, when the frame 1 is rocked on its spindle 4 away from the spring motor 5 the gearing carried by the frame is "freed", that is, the spindle 16 and ratchet wheel 19, rotate freely owing to the pawl 18 slipping over the teeth of the ratchet wheel.

The rotation of the bevel wheel 20 transmits motion to the bevel pinion 21, and spindle 22, and the spindle 22 rotates the spiral tooth wheel 23, and a worm 24 on the record disk table spindle 2; thus motion is imparted to the said toothed wheels and spiral and worm gearing, by causing the tooth wheel 15 to move over and in engagement with the stationary rack 13 by the spring motor 5, and the record is rotated at the required speed, which is regulated as next described.

The speed of rotation of the disk and its spindle 2 is regulated by the governor device 12 more particularly shown in Fig. 3. This device is of the well known character and is driven through the tooth wheel 25 mounted on the record table spindle 2, and a tooth pinion 26 gearing therewith and mounted on the spindle of the governor de-

vice 12. The governor device comprises weighted spring arms which in rotation fly or move outwardly from the spindle of the governor device, and pull or move downwardly a disk 27 on to the end 28 of a lever 29, which is pivotally mounted at 30. The position of the end 28 of the lever 29 relatively to the disk 27, is regulated by a thumb regulating nut 31, which screws on to the upper end of the spindle 4, (on which the frame 1 is carried,) and has a conically shaped lower end which acts directly upon a pin 32 attached to the outer end of the lever 29. The end 28 of the lever 29 is normally pulled away from the disk 27 by the spring 33, attached at one end to the lever 30, and at the other end to a part of the casing, and when the end 28 is to be moved toward the disk, the nut 31 is screwed farther on to the screw threaded end of the spindle 4, and rocks the lever 29 about its pivot 30 in such a manner as to move the end 28 of the lever toward the disk 27. The end 28 serves as a braking device for the disk 27, that is, when the disk 27 is pulled downwardly by the weighted spring arms of the governor, the disk bears against the end 28, and the speed of rotation is checked or reduced thereby.

The end of the lever 29, may have an anti-friction roller or ball upon it, which works in connection with the under side of the disk 27.

The sound box is mounted on gimbals as shown in Figs. 4 and 5, to give lateral play or movement and the proper adjustment and the needle will be pressed onto the record disk 10 by gravity, or by a slight spring.

The gimbals consist of an inner ring 38, to which the sound box tube 37 is connected by pins 39; and the ring 38 has pins 40 on it, which are mounted in the outer ring 41 directly connected with the trumpet tube 42, which will be fixed or stationary, and is without a sound arm. By this arrangement, it will be noted that the sound box 35 will have lateral play as well as vertical play, and the needle is free to follow the impressions of the disk readily and accurately.

With regard to the spring 5, this may be of a single type, or consist of two or more laminæ or springs.

The whole apparatus and parts described are mounted upon a suitable box, table or base 45; and the actuating lever 6 is preferably operated by a hand crank lever 46 on the outside of the box, which is connected up with the lever 6 through a spindle 47, a drum or wheel 48 upon it, and a chain 49 which wraps around the drum. By moving this lever 46, say about half a revolution, the frame 1 will be completely moved from its terminal position to the starting position, that is, it will be fully set, so that upon re-

lease; the complete action of the mechanism and record table will follow.

The winding of the motor spring, and the setting of the instrument generally, is effected by rocking or moving the frame or part carrying the spindle on which the record table is mounted, away from the spring motor; and when this frame is released, the spring which has been wound up returns or moves back the frame, and drives through the said toothed and other gearing and the stationary rack, the record spindle and record disk.

As the frame and gear are moved or actuated by the spring motor the disk will be moved relatively to the style or needle of the sound box; and the record will traverse therefor under the style or needle.

What is claimed is:—

1. In a sound reproducing or recording machine, a power motor, a record disk table, and a movable record table carrying part, having a flexible connection with the motor, whereby the latter is wound up when said part is moved in one direction, and said part is moved in the opposite direction by the motor when the latter is released.

2. In a sound reproducing and recording machine; the combination of a spring motor; a fixed toothed rack, a rockable frame on which are mounted a table for carrying the record, a spindle connected with the table, a governor device, and gearing for transmitting motion to the spindle including a toothed wheel which engages with the fixed rack, and a ratchet device; flexible means connecting the frame with the spring motor; and means for moving the frame away from the spring motor.

3. In a sound reproducing and recording machine; the combination of a spring motor; a fixed curved toothed rack; a rockable frame on which are mounted a record carrying table fitted with a spindle, a governor device, and gearing connected with the said spindle and which includes a ratchet device and a toothed wheel which engages with the fixed curved rack; a chain connecting the frame to the spring motor; means for rocking the frame away from the motor; and means for regulating the braking action of the governor device.

4. A sound reproducing and recording machine, comprising a spring motor; a stationary curved rack; a rockable frame comprising a record carrying table fitted with a spindle, a spring governor device, having a braking disk, and gearing which includes a ratchet device and a toothed wheel which engages with the curved rack; a chain connecting the frame to the spring motor; a hand actuated means for rocking the frame away from the spring motor; a spring ac-

tuated braking lever having means for regulating the position of the lever relatively to the braking disk of the governor; a sound box; and means for supporting the sound
5 box over the record table including gimbals which enable the sound box to move both vertically and horizontally, and comprise concentrically disposed rings fitted with

horizontally and vertically disposed pins and bearings.

10

In testimony whereof I affix my signature in presence of two witnesses.

JULIUS HARRIS.

Witnesses:

SOMERVILLE GOODALL,
DONALD COULTER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."



989,737.

Patented Apr. 18, 1911.

5 SHEETS—SHEET 1.

Fig. 1

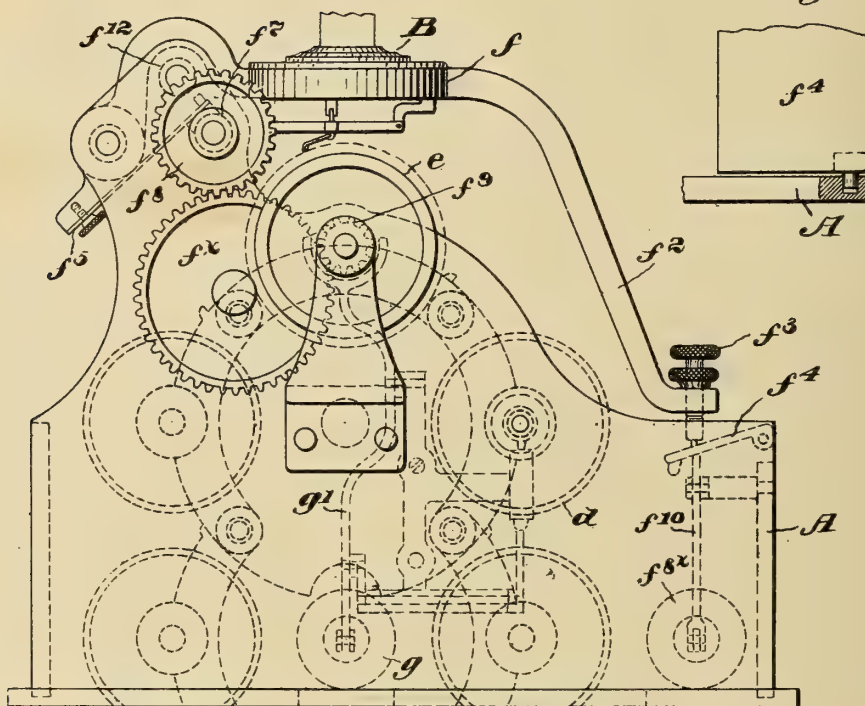


Fig. 3

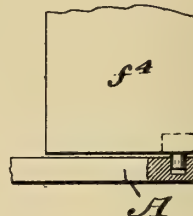
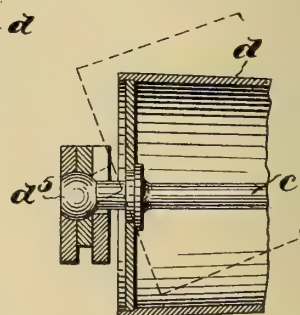


Fig. 2



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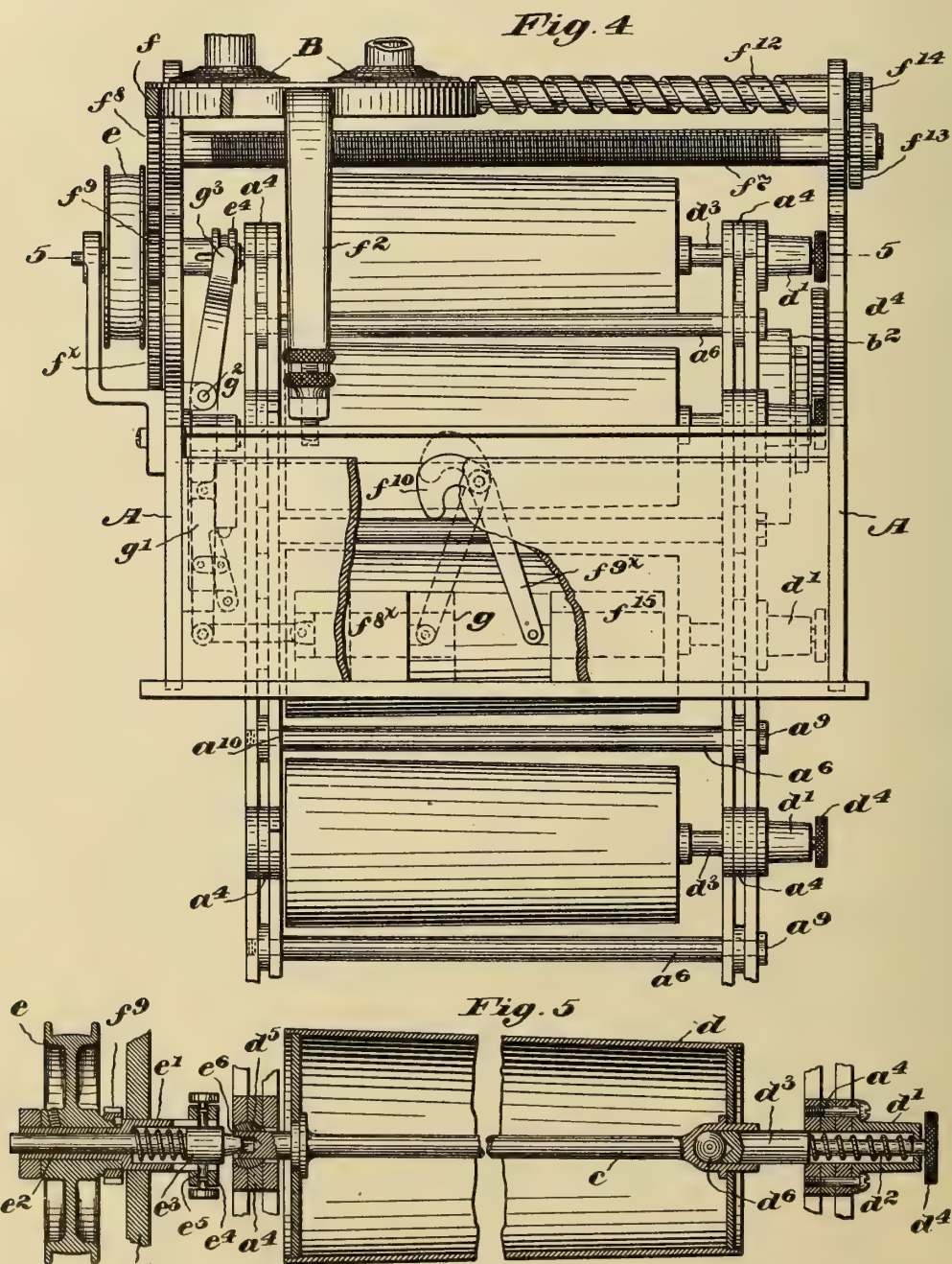
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SOUND REPRODUCING OR SOUND RECORDING MACHINE.
APPLICATION FILED JUNE 11, 1904.

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5 SHEETS—SHEET 2.



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5 SHEETS—SHEET 3.

Fig. 6

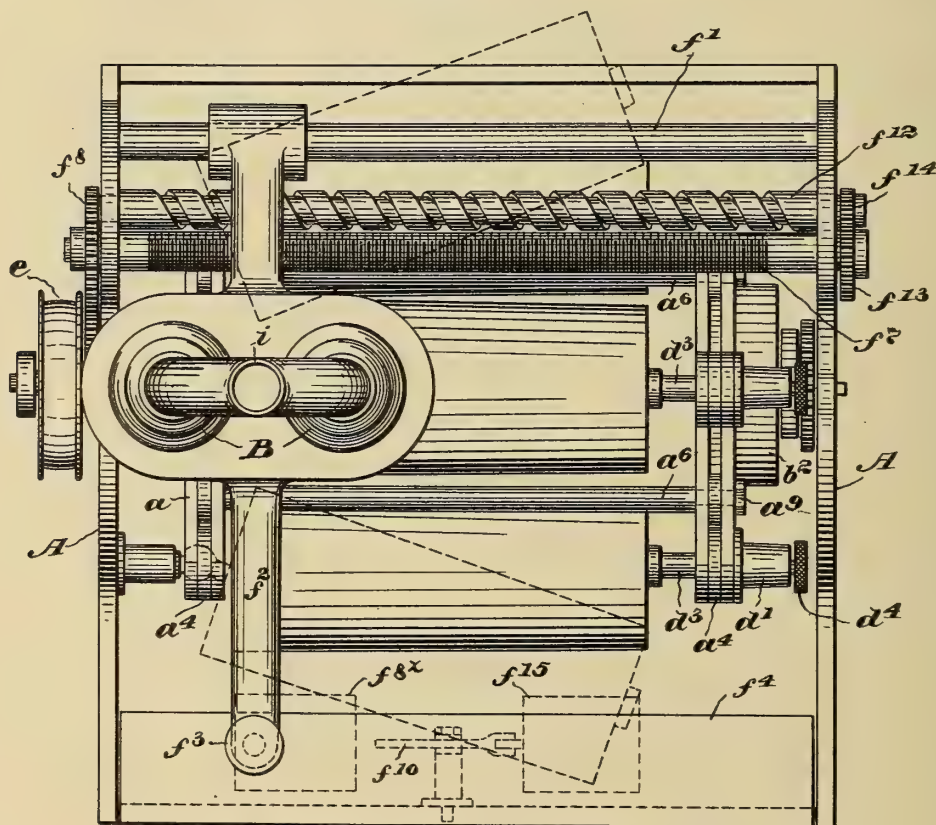
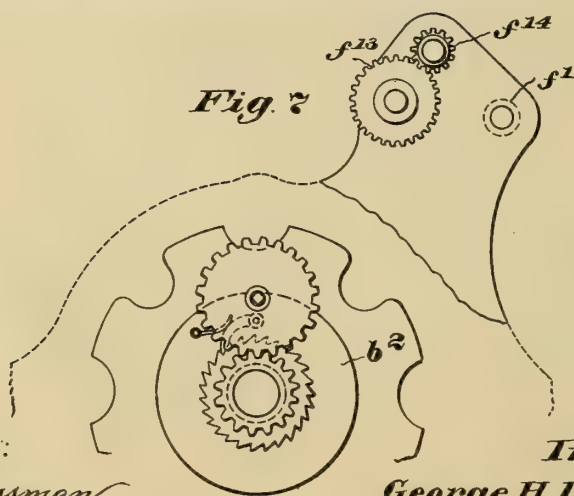


Fig. 7



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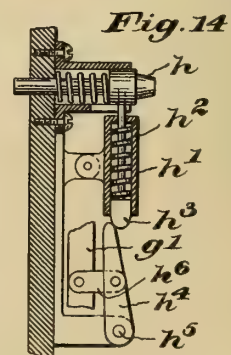
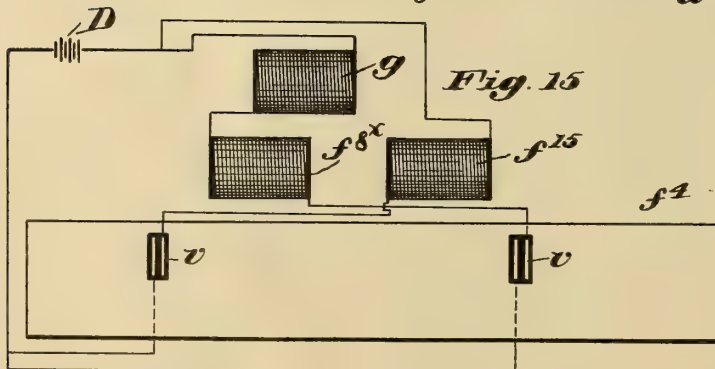
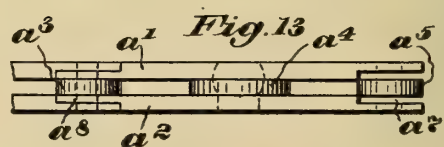
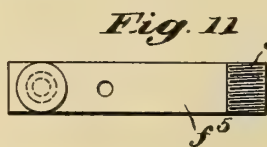
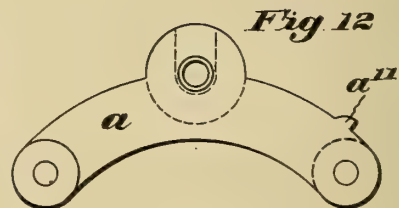
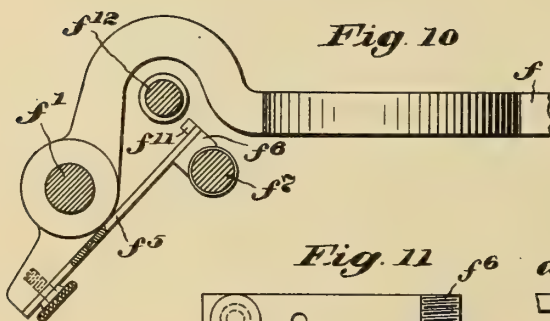
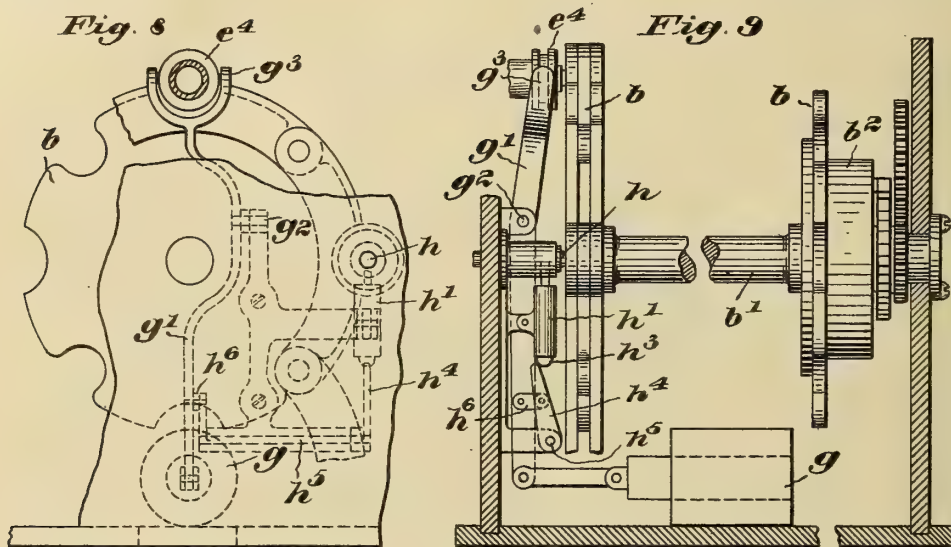
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5 SHEETS—SHEET 4.



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APPLICATION FILED JUNE 11, 1904.

989,737.

Patented Apr. 18, 1911.

5 SHEETS—SHEET 5.

Fig. 16

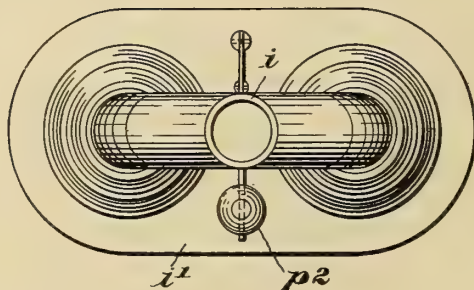


Fig. 17

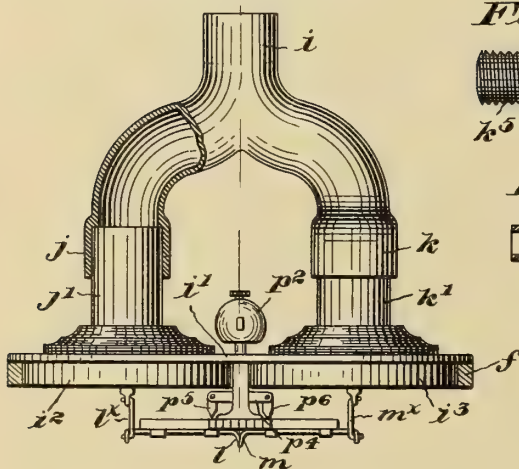


Fig. 21

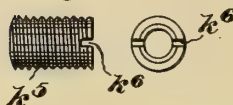


Fig. 22

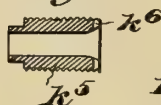


Fig. 18

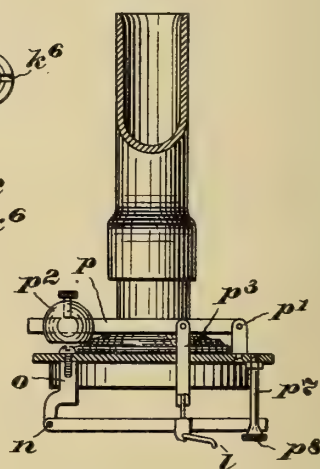


Fig. 19

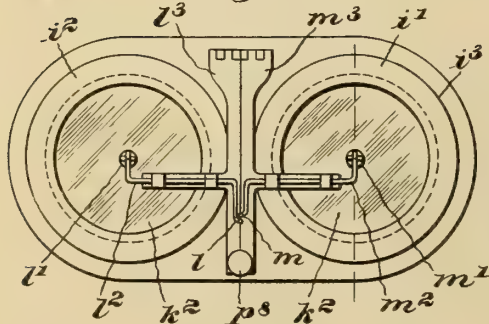
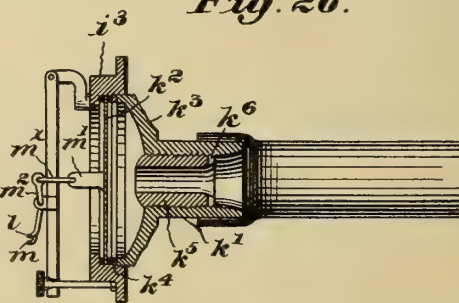


Fig. 20.



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UNITED STATES PATENT OFFICE.

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SOUND-REPRODUCING OR SOUND-RECORDING MACHINE.

989,737.

Specification of Letters Patent.

Patented Apr. 18, 1911.

Application filed June 11, 1904. Serial No. 212,079.

To all whom it may concern:

Be it known that I, GEORGE H. UNDERHILL, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Sound-Reproducing or Sound-Recording Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention relates to improvements in sound-reproducing and sound-recording machines. While applicable in many of its features to sound-reproducing machines of various types employing but a single record, it is directed more particularly in certain of its features to multiple record machines or those wherein there are employed a plurality of records adapted to be brought successively into reproducing or recording relation to suitable reproducing or recording mechanisms.

My invention will be best understood by reference to the following description, when taken in connection with the accompanying illustration of one specific embodiment thereof selected for illustrative purposes only; while its scope will be more particularly pointed out in the appended claims.

In the drawings,—Figure 1 is a side elevation of the embodiment of my invention selected for illustration, certain of the parts being broken away for clearness; Fig. 2 is a detail showing in section the swivel or jointed attachment of a record cylinder support; Fig. 3 is a detail of the tilting sound box rest; Fig. 4 is a front elevation partially broken away, of the machine illustrated in Fig. 1. Fig. 5 is a section, partially broken away, taken on the line 5-5 of Fig. 4, but shown on an enlarged scale. Fig. 6 is a plan view of the machine illustrated in Fig. 1. Fig. 7 is a detail of the feed screw gearing. Fig. 8 is a side elevation, and Fig. 9 a front elevation of the details of the device for locating and locking the record carrier. Figs. 10 and 11 are details of the feed mechanism for the sound box. Figs. 12 and 13 show the links or units of the endless record carrier respectively in elevation and plan. Fig. 14 shows a separate detail of the carrier locking device. Fig. 15 is a diagram of the electric circuits. Figs. 16 to 22 show details of my improved sound box.

Referring to the drawings, although many features of my invention are applicable to

machines other than multiple record machines, and to multiple record machines employing carriers widely different from that herein illustrated, by preference I employ a flexible, endless, multiple record carrier in the form of two chains, composed each of individual units or links, a a , passing over suitable guiding means as the sprockets, b b , and carrying between them the suitable supports, as the rods, c c , upon which are secured the record supports, herein the cylinders, d .

Referring more particularly to Figs. 1, 4, 12 and 13, each individual unit or link is composed of two parallel link members, a' and a'' , provided with the washers a^3 , a^4 and a^5 , the washers, a^3 and a^5 , preferably acting as rolls, and washer, a^4 , as a rigid separating and binding member between the two links. Elongated and preferably rigid tie members a^6 extend from one chain to the other, thereby joining one link flexibly to another and acting to maintain in fixed relative position the corresponding units of the two chain carriers.

The sprockets, b b , are suitably recessed to receive and firmly seat the washers, a^3 , a^4 , a^5 , each alternate recess being larger than the adjacent one to receive the washer, a^4 , which is of greater diameter than the washers, a^3 and a^5 . Adjacent links of the chain are connected together by dovetailed joints, each link of the chain being provided (Fig. 13) with end recesses, a^7 , to receive the projecting ears, a^8 , of the next adjacent link, the adjacent links being thus pivotally secured together by the tie rods, a^6 , which pass through in each chain carrier the ends of the two links and the sprocket-engaging washer. The tie rods, a^6 , are provided, (Fig. 4), with hexagonal or other suitably shaped heads, a^9 , by which the opposite threaded ends thereof are screwed against shoulders, a^{10} , bearing against the inside member of the opposite and corresponding link. The chain links are preferably provided with lugs, a^1 , the lug of one link resting against the back of the next adjacent link when depending as shown in Fig. 1, thereby to maintain the depending portion of the endless carrier in a substantially vertical position.

Each link or record carrying unit is arched to substantially conform in shape with the periphery of the guiding sprocket, and, when in engagement therewith, and particularly when supporting its record in op-

erative position, receives support from its sprocket, not only through the washer, a^4 , co-axial with the cylinder and on each side thereof through the washers, a^3 and a^5 , co-axial with the tie-rods, a^6 , but also through the intermediate, projecting, peripheral portions of the sprocket which enter between and engage with the inner walls of the separated links. The tie-rods, a^6 , hold the corresponding links in fixed relative position and form in effect a substantially rigid frame-work on which the record is supported and journaled, and this frame-work when its record is brought into operative position, by means of the effective interlocking engagement of each link with its sprocket, gives to the record a firm, unyielding and extended lateral support on either side of the axis of the record and at each end thereof.

The use of the flexible endless carrier described permits the utilization of any desired number of records without varying the dimensions or altering the proportions of the machine itself or the mechanism required to operate it, since the chains may be lengthened to accommodate any desired number of record cylinders, the cylinders out of engagement with the sprocket depending idly below the frame of the machine, an additional guiding device as the sprocket, b^x , being employed, if desired, at the farther end of their travel.

Referring more particularly to Figs. 4 and 5, each cylinder, d , is rigidly secured to rotate with its spindle support, c , the latter being supported between the two endless carriers during its entire travel. In order to permit a ready withdrawal of any record from its cylinder, I provide means temporarily for swinging one end of the cylinder away from its carrier, the opposite end thereof having a swinging or swivel support to permit this movement. This is effected by providing upon one of the carriers the cap, d' , suitable secured to the middle or crown of the link, a , said cap having a pocket containing the spring-pressed pin, d^2 , the head, d^3 , of which enters a suitable recess in the end of the cylinder spindle, c , thereby to provide a journal therefor. The end of the pin, d^2 , carries an exterior thumb piece, d^4 , by which the pin head, d^3 , may be withdrawn from the cylinder spindle against the pressure of the spring, and that end of the cylinder thereby left free to be swung outwardly as indicated in Figs. 2 and 6, for the withdrawal of the record. At the opposite end of the spindle, c , is rigidly secured the spherical bearing, d^5 , which rests in a socket formed by the outer member of the link, a , and the intermediate washer, a^4 , so as to permit of free rotation of the spindle, c , within the said socket, and also permit outward swinging movement of the cylinder

for the withdrawal of its record. As will more readily appear from Fig. 2, the inner member of the chain link is suitably slotted to receive the neck of the spindle immediately within the ball, d^5 , and to permit the outward swinging of the record-carrying cylinder whenever the pin, d^3 , is withdrawn from the spindle recess. To reduce the bearing friction to a minimum the inner end of the pin, d^3 , is suitably shaped to bear against a ball, d^6 , which is fixedly secured within the cup-shaped bottom of the spindle recess. Thus a record may be removed from its support at any desired point in the travel thereof by merely detaching its support from one point of attachment and swinging it about its point of swiveled attachment into a position where the record may be readily withdrawn.

The sprockets are rigidly secured to a carrier shaft, b' , suitably journaled in the frame of the machine, (Fig. 9), a spring, b^2 , or any other suitable means being employed for providing a constant rotative effect upon the sprocket shaft, b' , to cause movement of the record carriers into and out of operative relation with the recording and reproducing mechanism, which herein is located above the machine, the uppermost record being the one in operative position.

During recording or reproduction the cylinder, d , is rotated at uniform speed through any suitable, and preferably, electric motor (not shown), driving the pulley, e , secured to the sleeve, e' , the latter being journaled in the frame of the machine, A. Slidable within the sleeve, e' , is the cylinder drive shaft, e^2 , to the head, e^3 , of which is secured the collar, e^4 , by means of the pin, e^5 . The shaft, e^2 , and its head, e^3 , are normally spring-pressed inwardly toward the record carrier, the sleeve being slotted to receive the pin, e^5 , and permit relative movement between the sleeve and collar, e^4 , the latter moving inwardly and outwardly with the shaft. The inner end of the shaft e^2 is suitably shaped to enter a corresponding recess in the end of the alining cylinder spindle, c , suitable projections, e^6 , upon the shaft interlocking with corresponding recesses in the spindle to effect the driving movement.

During the rotation of the cylinder and the record carried thereby through the driving connections described, the sound box and stylus carrying mechanism, B, are progressively moved along the face of the record from one end thereof to the other. To effect this the sound box, B, is mounted in a yoke, f , slidably supported (Figs. 6 and 10) upon the shaft, f' and carrying (Fig. 1) at its opposite end the depending arm, f^2 , provided with the adjustable sliding support, f^3 , resting upon and slidable along the tilting rest, f^4 , (Fig. 1) hinged in the frame-work, A. During recording or reproduction, the rest, f^4 ,

is normally in the position shown in Fig. 1, and the finger, f^5 , (Figs. 1 and 10) secured to the yoke carrier f on the opposite side of its fulcrum support, f' , is thrown downwardly to cause the sectional nut, f^6 , held at the end of said finger, to maintain engagement with the fine threaded screw, f^7 . The latter is rotated through the gear, f^8 , in mesh with a gear, f^9 , the latter engaging in turn with a gear, f^{10} , (Fig. 5) upon the head of pulley, e , so that, during rotation of the record cylinder by said pulley, the said screw, f^7 , causes the travel of the nut, f^6 , and the yoke carrier, f , with the stylus lengthwise the record cylinder. When the end of the desired stylus travel has been reached, the sliding rest, f^3 , which is preferably provided with a bearing tip or point of electrically conductive metal, is caused to engage with two contacts, v , shown in diagram in Fig. 15 upon the tilting rest, f^4 , and make an electric circuit including a source of electromotive force, D , energizing the solenoid, f^{13} . The armature of the latter is connected to a lever f^{14} , to which is secured a cam, f^{15} , upon which the tilting rest, f^4 , is normally supported in the full line position shown, Fig. 4. Energization of the solenoid f^{13} causes the withdrawal of the lever, f^{14} , from the full line position shown in Fig. 4 to that shown in dotted lines, resulting in raising the tilting rest, f^4 , and the arm, f^2 , and the consequent withdrawal of the nut f^6 from engagement with the screw, f^7 , the pin or tooth, f^{11} , also carried by the finger, f^5 , immediately thereupon entering into engagement with the coarser threaded, reverse, feeding screw, f^{12} , rotated in a reverse direction from the screw, f^7 , by the gears, f^{13} and f^{14} , (see Fig. 7), thereby to effect the rapid return of the stylus-carrying mechanism to its initial position ready for engagement with a fresh record.

I have herein also provided means simultaneously with the return of the stylus-carrying mechanism for changing or shifting the records to permit automatically the presentation of a new record to the stylus and the repetition of the previously described movement of the latter with reference to the fresh record. To this end suitable locking devices are provided for locking the carriers against movement during the outward travel of the stylus, for releasing the carriers after the completion of said outward travel and for again locking the carriers when a succeeding record has been brought into alinement with the driving mechanism. When the sliding rest, f^3 , makes the circuit which reverses the movement of the stylus, it also effects energization of the solenoid, g , (Figs. 9 and 15), which operates to rock the lever, g' , about its fulcrum at, g'' , the end of the lever, g' , being provided with a yoke, g^1 , having studs engaging a groove in the col-

lar, e^4 , whereby energization of the solenoid moves the collar, e^4 , to withdraw the pin, e^2 , from the recess in the cylinder spindle, c . The sprockets, b b , and the carriers would now be free to move under the influence of the spring, b^2 , were it not for the additional locking and locating device, h , (Figs. 9 and 14), comprising a pin shaped similarly to the pin, e^2 , for entering the recess in the cylinder spindle and so located within a pocket on the frame, A , as to engage with the cylinder next adjacent the one in operative position. The locking or locating pin, h , is adapted to be thrown into or out of engagement with the cylinder spindle through movement of the pivoted frame, h' , yieldably connected to the head of the rod h through the sliding and downwardly spring pressed pin, h^2 . The head, h^3 , of the pin, h^2 , contacts with a cam shaped end of the arm, h^4 , adapted to be rocked about its fulcrum, h^5 , through the link, h^6 , connected to the rocking lever, g' . When the latter is moved by the solenoid, g , to withdraw the rod, e^2 , from the spindle, c , and release the same, the lever, h^4 , is also thrown laterally, and right-handedly as viewed in Fig. 14, to rock the frame, h' , about its fulcrum and throw the rod, h , backwardly out of engagement with its previously engaged spindle, the spring-pressed head, h^3 , of the pin, h^2 , yielding to permit the cam end of the lever, h^4 , to snap by the same into a position of rest. By this movement the record carriers are wholly released, and the sprockets start to revolve to move a fresh record into position. During the succeeding movement, however, the locating device, h , is spring-pressed against the outer faces of the chain links as the latter pass before the same, immediately snapping into the recess of the next spindle as the latter comes into alinement therewith, locating the new position of the record carriers and preventing further movement thereof. As soon as the solenoid, g , is de-energized by the withdrawal of the sliding rest, f^3 , from the contact pieces upon the tilting rest, the pin, e^2 , will also enter the recess of the spindle now in operative position, to rotate the latter and to cooperate with the stylus when the latter has been returned to its initial position. On the de-energization of the solenoid, g , and the return of the spring pressed rod, e^2 , into the spindle recess, the cam lever, h^4 , is also returned to its normal position as shown in Fig. 14.

It may sometimes happen under a strong relative influence upon the sprocket shaft, h' , as for example, when the spring, b^2 , is tightly wound up, that a considerable movement of the sprockets will take place and perhaps the full movement necessary to bring a fresh record into operative position, before the sound box and the sliding rest

have traveled far enough on reverse movement to break the electric circuit and de-energize the solenoid, g , thereby to free the drive shaft, e^2 , for reëntering the next spindle recess. The provision of the locating device, h , however, makes the relative movements of the carriers and the sound box immaterial, since the pin, h , is always in position after the carrier movement has once begun, to stop such movement at the proper time.

When the stylus reaches its initial position the sliding rest, f^3 , is caused to make a circuit through a third solenoid, f^{15} , (Figs. 4 and 15), causing the return of the cam, f^{10} , to the position shown in Fig. 4, and the lowering of the tilting rest, f^4 , thus throwing the nut, f^6 , again into engagement with the fine feed screw, f^7 , and repeating the outward travel of the stylus with the fresh cylinder.

Referring to Figs. 16 to 22, I have there shown one form of my improved sound box which I preferably employ. The sound tube, i , is preferably bifurcated, to provide the branches, j , and, k , into which may be slid and frictionally held the tubular portions, j' , and, k' , of the sound box. The latter is provided with a double set of recording and reproducing devices, and I have herein shown those of one set as substantially duplicated by those of the other set. This, it is to be understood however, is not essential to my invention as the diaphragm and other elements of the mechanism may for certain purposes be widely different. The sound box consists generally of a double head or casing, i' , and when in use is adapted to be frictionally held within the suitably shaped double yoke, f , already referred to.

The casing, i' , is provided with two cylindrical portions, i^2 , and, i^3 , that shown in, i^3 , for example (see Fig. 20), being provided with a diaphragm, k^2 , placed between two annular rings of yieldable packing material, such as rubber, and held against a shoulder in the casing by means of the back-piece, k^3 , screwed into the back of the casing i' , against the preferably metallic washer, k^4 . Within the tubular portion, k' , of the back-piece, k^3 , and preferably axially alined therewith and with the diaphragm, k^2 , I have provided the throat, k^5 , preferably threaded or otherwise constructed to provide adjustment thereof relatively to the face of the diaphragm, the end of the throat adjacent the diaphragm being suitably shaped for the most efficient effect, as by beveling the same, in the manner shown.

I have found that it is not only desirable to have the sound orifice of each throat adjustable relatively to the diaphragm, but that each particular class of sound requires a special sound orifice for its most effective

reproduction. For example I have found that the full harmony of a brass band will usually be best developed through the employment of a throat having the general form of that shown in Figs. 20 and 21, while the note of a violin is more faithfully reproduced by a differently shaped throat, as for example, that shown in section in Fig. 22. The provision of a plurality of such throats, each proportioned or formed with respect to a particular quality of sound, in the reproduction of which it is intended to be used, and replaceable one by another, forms an important feature of my invention. Referring to Figs. 20 and 21, I have provided the slot, k^6 , in the outer end of the throat member, which when the box is removed from the sound tube, may be conveniently engaged with a screw driver or other implement to adjust the mouth of the throat in any desired relative position to the diaphragm, or to remove the same entirely and replace it by another of different shape, size or proportion.

The two styluses are here employed, in order to provide a multiple effect, the production of which, however, is obviously not limited to the use merely of two. Each of two styluses, l and m , is connected to its respective diaphragm through the connecting body l' , m' , the links, l^x , and, m^x , and the rockshafts, l^2 , m^2 , so that, when in the operative position shown in Fig. 1 (see also Fig. 19), the point of the second stylus is caused to trail in the same record groove as the first stylus, but directly and immediately behind the latter, and also arranged so that the vibrations communicated to each stylus point are transmitted directly and efficiently to the corresponding diaphragm. The stylus points with their rockshafts are respectively supported and movable with the vibratable levers, l^3 , and m^3 , arranged side by side and hinged at, n , (Figs. 18 and 20) to permit the individual and relative movement of the said levers to and from the surface of the record, the hinged support, n , being, however, itself swingingly mounted upon the stud, o , Fig. 18, to permit a slight lateral movement common to each stylus movement when such movement is requisite. Thus, although free vibration is permitted the stylus points in the reproduction of the intended sound, they are compelled always to track one after the other, and the lateral movement of one no matter from what cause must be followed by a like movement of the other.

An equalized tension, tending normally to press the stylus points toward the face of the record, is maintained upon the two stylus points by means of the lever, p , fulcrumed at, p' , carrying the adjustable weight, p^2 , the latter acting through the bar, p^3 , equalizing rod, p^4 , and pressure points,

p^5 , p^6 , engaging respectively or connected with the backs of the levers, l^3 , and m^3 . Thus, when the sound box is adjusted relatively to the record, and the stylus point or points have found and entered the groove therein, the force pressing the same into the groove may be varied by adjustment of the weight, p^2 , along the lever p ; this force however, being distributed upon the two points by means of the equalizing bar, p^4 , thereby to maintain an individual tension upon each of the coöperating stylus points, such tension being proportioned to their individual requirements and the movement of one stylus point with its supporting lever in no way conflicting with simultaneous movement of the other point and its lever, whether such movements are similar or dissimilar. In order to relieve the diaphragm and its connections from the weight of the stylus parts, including the weight, p^2 , when the sound box has been lifted or withdrawn from the face of the record, I have provided the supporting pin with a cone-shaped enlarged head, p^8 , against which the suitably formed ends of the levers, m^3 , and, n^3 , rest when the stylus points are withdrawn from the record, but so located as to permit free vibration of the said levers, under the influence of the record, when the points are in contact therewith and moved under the influence of the record groove therein. The peculiar cone shaped head of the face, b^8 , and the correspondingly formed walls upon the two levers, permit repeated withdrawals of the points from the record groove with positive assurance, however, that the points will meet the record at exactly the same spot from which they were withdrawn, the record and the sound box, meanwhile, having undergone no relative movement.

I have found that the arrangement shown of multiple diaphragms, where they are grouped or clustered about a common position toward which their vibration mechanism is directed, provides a highly efficient, and in fact so far as I am aware the only practical, construction for obtaining a multiple effect. I have also found that the effectiveness of the machine is greatly increased by the inter connection which exists between the vibration parts of each system through which there is maintained a constant tendency for the stylus points and diaphragms to move in conjunction and co-operation, each one with the other or others.

It will be understood that my invention is susceptible of embodiment in a great variety of forms and may be combined in various ways which I have not here attempted to illustrate, since the same are included within the scope of my invention as set forth.

Claims.

1. A multiple record phonograph having

a plurality of record supports adapted each to travel to bring its record into and out of operative relation to the machine, and means for rotating a record placed in operative position, said means being adapted for engagement with or disengagement from said successive records, said record supports being each individually detachable from its connection with the machine at one point to permit the withdrawal of its record while still maintaining connection with the machine at another point or points.

2. A multiple record phonograph having record rotating means, and a plurality of record supports, the records carried thereby being adapted for successive engagement with the rotating means, the record supports being individually movable about their points of attachment to the machine to permit the removal of their records when disengaged from the said rotating means.

3. A multiple record phonograph having a plurality of record holding members swingingly supported upon a common carrying device.

4. A multiple record phonograph having a linked carrier and a plurality of record holding members swingingly supported upon the links thereof.

5. A multiple record phonograph having a traveling carrier, a plurality of record supports attached each to said carrier at a plurality of points, record rotating means, means for moving said carrier to bring a record into operative position and for bringing the same into engagement with said rotating means, means for disengaging the record from said rotating means and moving said carrier to bring a fresh record into operative position, and an axially yieldable connection at one of the points of attachment of each record support to its carrier to permit withdrawal of a record when out of operative position.

6. A multiple record phonograph having a movable record carrier for carrying a plurality of records, said records having each a body movement with the carrier, a rotary movement upon its axis, and a swinging movement about a point of attachment to the carrier.

7. A sound reproducing or sound recording machine having a swingingly mounted record support, record rotating means therefor, and means for clutching said rotating means to and unclutching the same from said swinging support.

8. In a sound reproducing and sound recording machine, a rotary swingingly mounted, record supporting spindle, record rotating means, and a clutching device adapted to interlock with the end of said spindle and connect the same to said rotating means.

9. In a sound reproducing and sound re-

cording machine, a rotary hinged record support, record rotating means, and means for connecting said rotating means to, and disconnecting the same from the hinged end of said support.

10. In a multiple record phonograph a plurality of record supports, a linked carrying member, said supports being attached each to a link of said carrier by a hinged connection.

11. A multiple record phonograph having a plurality of linked record carrying members, and a plurality of record supports, said record supports being attached to the links of said carriers by a hinged connection at one end and a yieldable connection at the other end.

12. A multiple record phonograph having a plurality of record supports, linked carrying means therefor, and a toothed sprocket over which said linked carrying means travels, said carrying means having a plurality of links adapted to engage each at its opposite ends with the teeth of said sprocket and providing an intermediate point of attachment for the record support.

13. A multiple record phonograph having a plurality of record supports, a linked carrying member therefor, a toothed sprocket, said carrying member having a plurality of links adapted each to engage simultaneously with a plurality of sprocket teeth, and means for attaching said supports to said links.

14. A multiple record phonograph having a plurality of supports, a linked carrying member to which said supports are individually and removably attached, and a releasing member for each of said supports movable in the direction of the axis of the record to release said support from the carrying member and permit the removal of its record.

15. A multiple record phonograph having a plurality of record supports, carrying means therefor comprising a pair of linked carrying members between which records are carried, and guiding means for each of said linked carriers, the opposite links to which said record supports are attached engaging each with said record guiding means at their opposite ends.

16. A multiple phonograph having a plurality of record supports, carrying means therefor comprising a plurality of linked carriers, and means between the records carried thereby connecting said carriers.

17. A multiple record phonograph having a plurality of record supports, carrying means therefor comprising a plurality of articulated carriers between which the record supports are carried, and means to permit individual removal of the records from their supports.

18. In a sound-reproducing or sound-

recording machine employing a plurality of records, the combination of flexible record carrying means supporting said records at each end thereof and means for permitting withdrawal of an individual record.

19. A multiple-record machine of the class described having carrier guiding means, and flexible record-carrying means the individual record-carrying units of which are in interlocking engagement with carrier guiding means at a plurality of points.

20. A multiple-record machine of the class described having flexible carrier-means, comprising coöperating carrier-members to which the records are journaled and by which they are caused to travel to and from their operative positions, and stiffening means between said members and intermediate the records carried thereby.

21. In a device of the class described, a plurality of record-carrying chains, guiding means for each, and guide engaging means connecting the said chains intermediate the records.

22. In a sound-reproducing or sound-recording device, the combination with flexible record-carrying means for supporting the record at each end thereof, of means for giving the record, when in operative position, an extended rigid lateral support on either side of the axis thereof.

23. A sound-reproducing or sound-recording device having flexible record-carrying means employing an arched carrying unit.

24. In an apparatus of the class described employing a plurality of records, the combination with electromotive devices and means automatically to act upon said electromotive devices on the completion of one record to bring a succeeding record into operative position.

25. In an apparatus of the class described employing a plurality of records, the combination with means automatically to advance the records one by one to playing position, electromotive devices, and means automatically to act upon said electromotive devices to cause the restoration of the recording and reproducing mechanism to its initial position on completion of its travel throughout a record.

26. In an apparatus of the class described, the combination with a plurality of records of electrically controlled record-changing means therefor.

27. In an apparatus of the class described, the combination with a plurality of records, means for automatically advancing said records to present them one by one to the sound reproducing mechanism, and electrically controlled means for returning the reproducing or recording mechanism to its initial position.

28. In an apparatus of the class described employing a plurality of records the combi-

nation with means for presenting the records in succession to the sound reproducing mechanism, means for restoring the reproducing mechanism to its initial position on completion of its travel throughout a record, of
5 electromotive devices for actuating said means, and circuit changing means carried by the reproducing mechanism for setting in operation said electromotive devices.

10 29. In an apparatus of the class described employing a plurality of sound records, means automatically to bring the records into and out of operative position, means

automatically to restore the reproducing mechanism to its initial position upon each
15 change of record, and electrical contact means carried by the reproducing mechanism for setting in operation said record changing means.

In testimony whereof, I have signed my
20 name to this specification, in the presence of two subscribing witnesses.

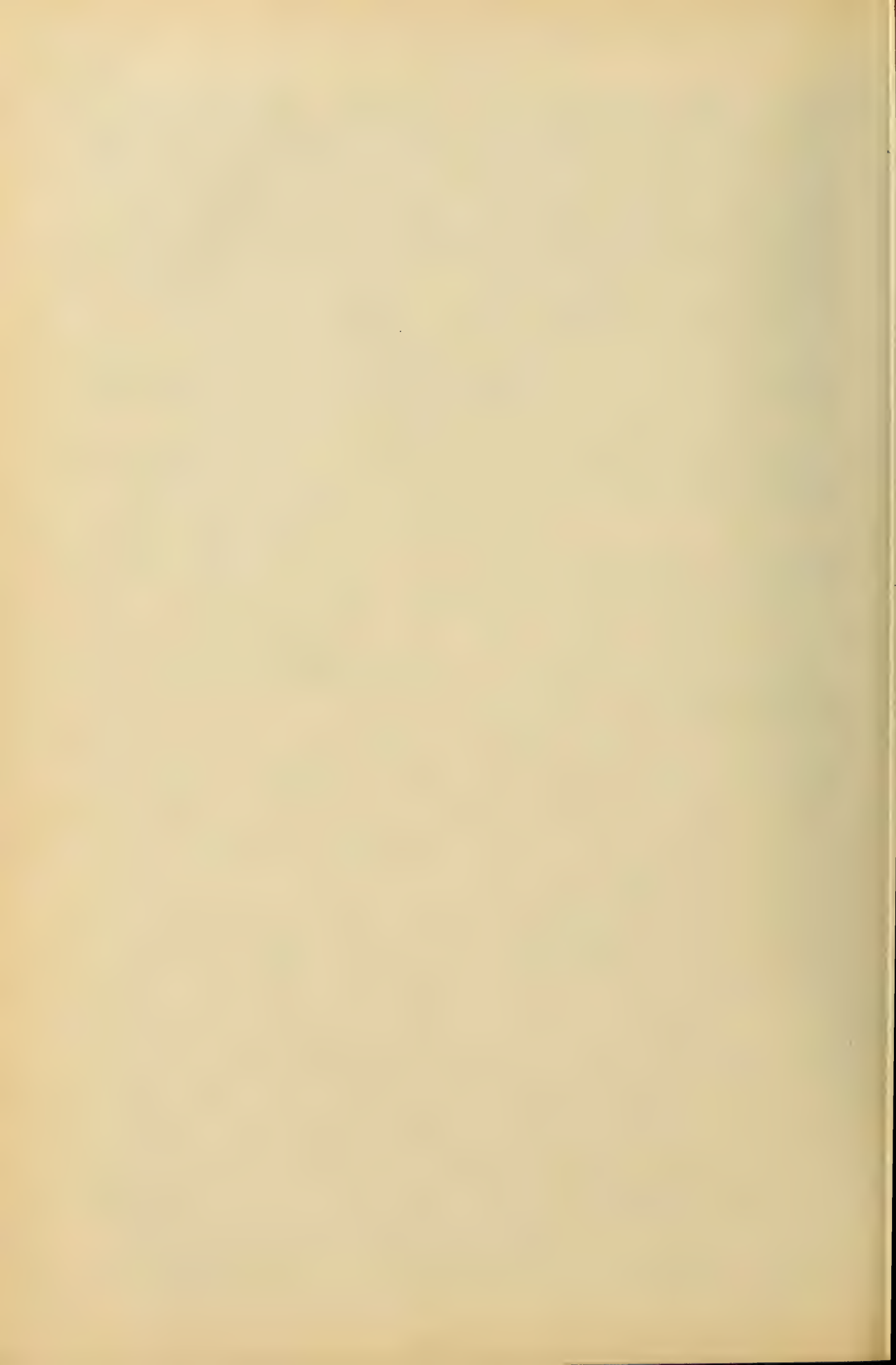
GEORGE H. UNDERHILL.

Witnesses:

RALPH C. POWELL,

HORACE A. CROSSMAN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,
Washington, D. C."



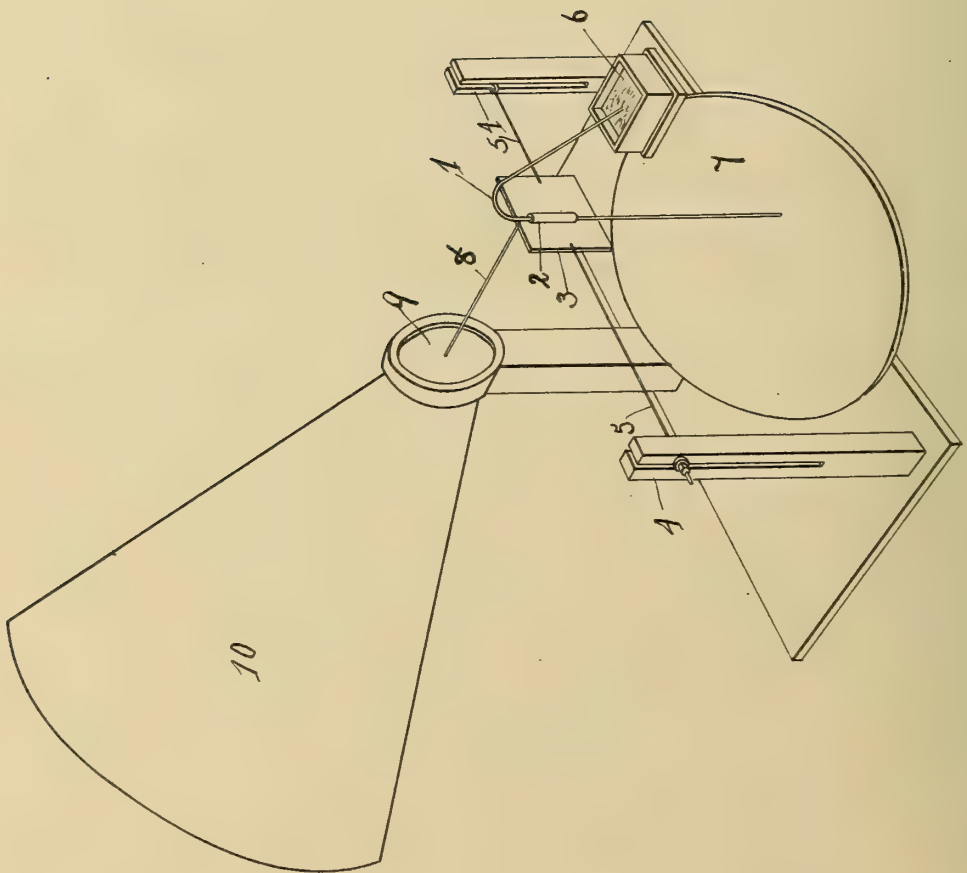
I. KITSEE.

PRODUCING PHONOGRAPHIC RECORDS.

APPLICATION FILED MAY 23, 1907. RENEWED JAN. 6, 1911.

990,144.

Patented Apr. 18, 1911.



WITNESSES:

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INVENTOR

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UNITED STATES PATENT OFFICE.

ISIDOR KITSEE, OF PHILADELPHIA, PENNSYLVANIA.

PRODUCING PHONOGRAPHIC RECORDS.

990,144.

Specification of Letters Patent.

Patented Apr. 18, 1911.

Application filed May 23, 1907, Serial No. 375,234. Renewed January 6, 1911. Serial No. 601,242.

To all whom it may concern:

Be it known that I, ISIDOR KITSEE, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Producing Phonographic Records, of which the following is a specification.

My invention relates to an improvement in means for producing phonographic records.

One of the objects of the invention is, to produce a record without actual contact between the means actuated by the vibrating diaphragm and the material on which the record is produced.

A second of the objects is to produce a recording device provided with means to adjust the same for the purpose of enlarging or reducing the undulating recording lines.

The drawing illustrates in perspective view a recording device embodying my invention.

In this device, 10 is the sound collector and 9 the vibrating diaphragm. The recording means are here illustrated as the siphon 1 dipping with one terminal into the liquid 6, the other terminal being in juxtaposition to the plate adapted to have recorded thereon the record. The means to suspend the siphon 1 are here illustrated as consisting of the horizontal thread 5 secured to the uprights 4, 4. To this thread is secured the plate 3 and on this plate is the tube 2. One of the legs of the siphon is carried through this tube. The plate 3 is connected through the rod 8 with the vibrating disk 9.

The operation of this device is as follows: The disk 7 is rotated at the required speed through one of the speed-mechanisms usually employed in the production of phonographic records. The siphon 1 is then placed into the tube 2. If it is desired that the undulations should be of great amplitude, then the whole length of one of the legs of the siphon shall be drawn through the tube, and if it is desired that the undulations should be of lesser amplitude, then the siphon should be drawn upward, so that only part of one leg shall protrude from the tube 2. To produce records, of which part of the lines should be of large and part of the lines of small amplitude, it is only necessary that the person in charge should, dur-

ing the time that the sound waves are impinged on the vibrating diaphragm, raise or lower the siphon. The liquid 6 will, as is well understood, rise in one leg of the siphon and will issue from the other leg. This liquid may consist either of a dark liquid, such as ink, or may consist of an etching fluid, or an etching-resisting fluid. Such in broad outlines are the means for producing records and the means for changing the amplitude of these records at the will of the operator, without necessitating the changing of the means to produce the air-waves.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In a phonographic recorder, a vibrating diaphragm, recording means, means for yieldingly suspending said recording means independently of the diaphragm, means to permit the position of the recording means to be varied relatively to the suspending means, whereby the amplitude of the undulations may be varied, and means to connect said suspending means to the diaphragm.

2. In a phonographic recorder, a vibrating diaphragm, a recorder proper associated therewith, means for yieldingly suspending the recorder proper independently of the vibrating diaphragm, means for transmitting the vibrations of said diaphragm to said recorder proper, and a mounting for the recorder proper to permit the position of the recorder proper to be varied in relation to said suspending means, whereby to increase or decrease the amplitude of the recorded lines.

3. In a phonographic recorder, a vibrating diaphragm, a recorder proper associated therewith, means for yieldingly suspending the recorder proper independently of the vibrating diaphragm, means for transmitting the vibrations of said diaphragm to said recorder proper, and a connection between the recorder proper and said suspending means, whereby the position of the recorder proper may be shifted relatively to said suspending means to increase or decrease the amplitude of the recorded lines.

4. In a phonographic recorder, a vibrating diaphragm, a recorder proper associated therewith, means for yieldingly suspending the recorder proper independently of the vibrating diaphragm, means for transmitting the vibrations of said diaphragm to

said recorder proper, and means for slid-
ably mounting the recorder proper upon
the suspending means, whereby the position
of the recorder proper may be varied in re-
5 lation to said suspending means to vary the
amplitude of the recorded lines.

10 5. In a phonographic recorder, a vibrat-
ing diaphragm, a siphon, means for sus-
pending said siphon independently of the
diaphragm, a connection between said sus-
pending means and said diaphragm, and
means to permit the position of said siphon
relatively to said suspending means to be
15 changed, whereby to vary the amplitude of
the recorded lines.

6. In a phonographic recorder, a vibrat-
ing diaphragm, a siphon, a support for said
siphon yieldingly mounted independently of
the diaphragm, a connection between said
support and said diaphragm, and means to 20
permit the position of said siphon relatively
to said suspending means to be changed,
whereby to vary the amplitude of the re-
corded lines.

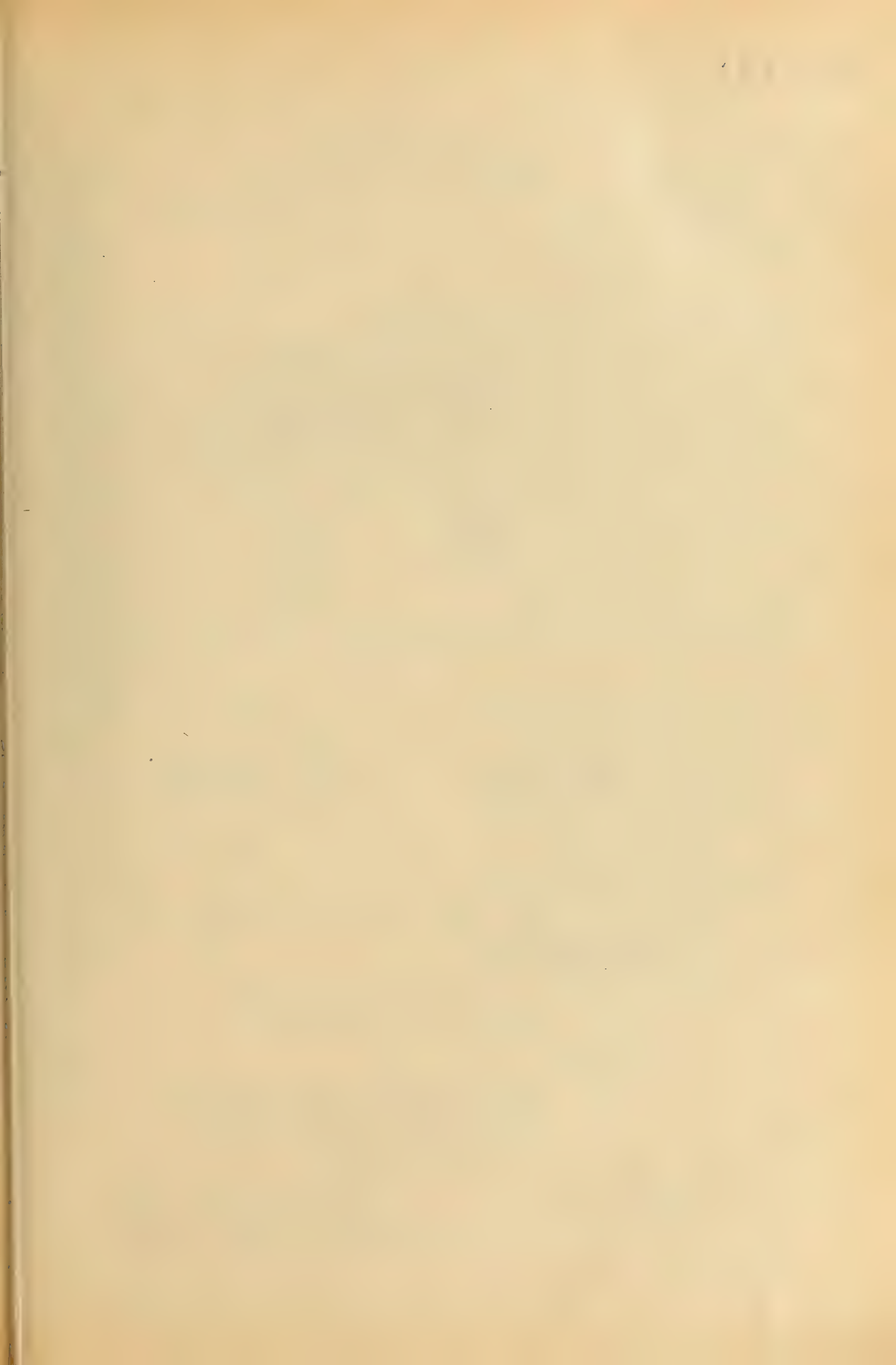
In testimony whereof I affix my signa- 25
ture in presence of two witnesses.

ISIDOR KITSEE.

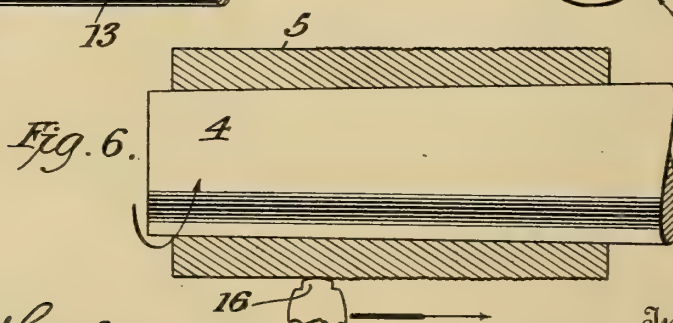
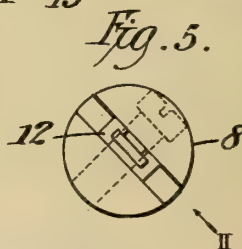
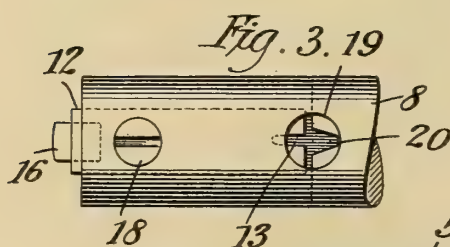
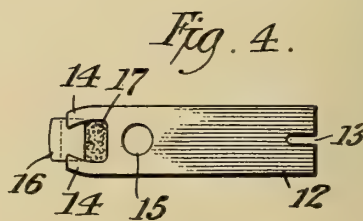
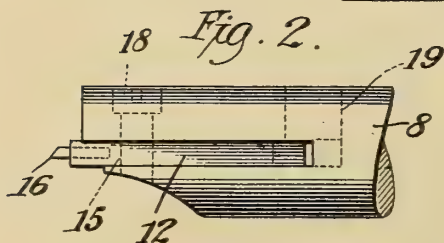
Witnesses:

MARY C. SMITH,
EDITH R. STILLEY.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,
Washington, D. C."



990,366.



Witnesses:
J. C. Thompson
M. A. Ford

Inventor
Thomas H. Macdonald
By his Attorney &
Hawes, Cameron, Lewis & Kerr

UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO AMERICAN GRAPHOPHONE COMPANY, OF BRIDGEPORT, CONNECTICUT, A CORPORATION OF WEST VIRGINIA.

SHAVING-MACHINE FOR SOUND-RECORDS.

990,366.

Specification of Letters Patent.

Patented Apr. 25, 1911.

Application filed May 11, 1909. Serial No. 495,283.

To all whom it may concern:

Be it known that I, THOMAS H. MACDONALD, a citizen of the United States of America, and a resident of Bridgeport, Connecticut, have invented a new and useful Improvement in Shaving-Machines for Sound-Records, which improvement is fully set forth in the following specification.

My invention relates to certain improvements in graphophone and phonograph shaving-machines, intended for shaving off the surface of a cylindrical sound-record in order to obtain a smooth surface for use in further recording.

The apparatus is especially useful in connection with so-called "dictaphones" or machines for dictation purposes.

One object of the invention is to enable the operator to obtain a very minute and accurate adjustment of the shaving-knife, even while the machine is running, whereby sufficient material will be removed from the cylinder, but no more material than is necessary. By this economy in the material shaved off, the cylinder can be shaved and used a greater number of times. The result of my invention is to prolong the life-time of a dictation-blank.

Another object of the invention is to prevent clogging of the knife by chips or shavings.

My invention consists of the novel construction and arrangement of parts for accomplishing the foregoing, and further of certain details hereinafter set forth and claimed.

The invention will best be understood by reference to the accompanying drawings, in which—

Figure 1 is an end view, partly broken away, of the parts of a shaving-machine containing my invention; Fig. 2 is a detail, showing the knife-holder carrying the shaving-knife and mounted in the knife-bar, the view being from the direction II of Fig. 5; Fig. 3 is a side view of Fig. 2; Fig. 4 is a plan of the knife holder and knife; Fig. 5 is a front view of the knife-bar, showing the diagonal position of the knife; and Fig. 6 is a diagram to indicate the direction of the operation.

Referring to the drawings, 1 is a portion of the bed or base-plate of a shaving machine, which in its rudimentary features is constructed on the usual lines.

2 is the feed-screw which propels the carriage 3 longitudinally, parallel with the revolvable mandrel 4.

5 represents a cylindrical sound-record, placed upon the mandrel in order to be shaved. The carriage 3 has a transverse horizontal bore, countersunk at its rear to provide the shoulder 6. Adjacent to the countersink is a screw-threaded seat 7, parallel to the bore in the carriage. 8 is the knife-bar, having a head 9 at its rear. A lateral projection from this head is apertured to receive freely the shank of the adjusting-screw 10, which screws into threaded seat 7, and has a shoulder bearing against the projection of head 9.

11 is a coil spring, seated in the countersink, and encircling the bar 8; it bears against shoulder 6 and head 9, and tends to force the bar rearward, away from the cylinder 5.

In practice, the head of the adjusting-screw is made comparatively large (say an inch and a quarter in diameter), and the thread of the screw is comparatively fine (say forty threads to the inch), in order to permit very delicate longitudinal adjustment of the knife-bar 8 against the spring 11. The shaving-knife is carried by the forward end of knife-bar 8, which latter may be provided with a shaving-box.

The forward end of the knife-bar is slotted longitudinally, the slot preferably extending in a diagonal direction (as seen in Fig. 5), to receive the knife-holder. 12 is this knife-holder, a rectangular plate of brass. At its rear is a notch 13; a groove is milled out at its forward end, leaving on each side wings 14-14; and near its front end is provided the hole 15.

16 is the knife, preferably a slab of sapphire, which preferably is provided with a beveled edge (see Fig. 2) that is curved as seen in Fig. 4. The knife 16 is inserted between wings 14-14, which are then forced down in a press to clamp the knife in place; and shellac 17 is applied to make it more secure. The holder 12 with its knife 16 is inserted in the (diagonal) slot in the forward end of bar 8, where it fits snugly; and a screw 18, through the end of bar 8, passes through hole 15 to secure the holder 12, and to act as a pivot upon which the holder can be rocked in its diagonal plane. There is a transverse hole 19 in bar 8, which exposes

the notch 13 at the rear of holder 12; and opposite this notch is provided a notch 20. By placing the blade of a screw-driver in hole 19, so that one edge thereof enters notch 13 and the other edge enters notch 20, the knife-holder and knife can be rocked on screw 18 as a pivot, by turning the screw-driver axially. This operation adjusts the position of the knife-edge with respect to the surface of cylinder 5. And this rocking-adjustment can be effected without stopping the apparatus.

21 is the shaving-box carried on the forward end of bar 8. It is shown as a long narrow box extending vertically below the knife-bar. This bar 8 enters through the rear wall of box 21, and the edge of the knife 16 protrudes slightly through an aperture in the front wall, which at this point is slightly convexed forward to act as a shield. This aperture is enlarged, below the knife, sufficiently to let chips and shavings pass into the box. Preferably the top of the box may rest upon the bar 8, and a screw, as 22, may hold the box to the bar. The bottom of the box 21 may be left open, to discharge the shavings in a larger receptacle below.

The revolving mandrel 4 carries the cylinder 5 in the direction indicated by the arrow; so that the surface adjacent the knife 16 is traveling upward. In consequence, the chips or other material shaved off the cylinder 5 pass beneath knife 16, and drop into box 21. On account of the upward stress upon knife 16, knife-bar 8 has its prime contact at the point 23, and its secondary contact at the point marked 6,—in other words, the bar is jammed and held firmly in place. The pressure of spring 11 against head 9 tends to accentuate this; and the result of this rigid holding of the bar is to produce a more uniform cut and a smoother surface upon cylinder 5. But at the same time, the bar is readily adjustable longitudinally, to and from the cylinder, and without stopping the operation of the shaving-machine.

Preferably the carriage is fed from the outer (smaller) end of the tapering mandrel, toward its inner (larger) end. In the ordinary recording and reproducing of sound the practice is to revolve the cylinder at a standard surface speed, but in shaving record-cylinders the machine can be run at a far higher speed; consequently there is much greater stress upon the shaving-knife than upon a recorder or reproducer. In recording and in reproducing there is no particular advantage in propelling the stylus from the outer end of the cylinder rather than from its inner end; but if the knife of a high-speed shaving machine should travel toward the outer or free end of the machine, there is a tendency to loosen the cylinder upon the tapered mandrel, with consequent defects in shaving. There is, therefore, a

marked difference, resulting in a decided improvement, in feeding the knife of a shaving-machine from the outer to the inner end of the cylinder.

I have described my invention with some particularity but only for the sake of clearness, since modifications may be made in the construction of the parts and in their arrangement, without in any case departing from the spirit of my invention.

Having thus described my invention, I claim:

1. A shaving-machine for cylindrical sound-records, comprising the combination with a revoluble mandrel for carrying a record-cylinder, and a carriage traveling parallel therewith, of a shaving-knife presenting a curved edge and pivotally mounted upon said carriage for presenting different portions of said curved edge to said cylinder.

2. A shaving-machine for cylindrical sound-records, comprising the combination with a revoluble mandrel for carrying a record-cylinder, and a carriage traveling parallel therewith, of a shaving-knife lying in a diagonal plane and having a curved edge and pivotally mounted upon said carriage for presenting different portions of said curved edge to said cylinder.

3. A shaving-machine for cylindrical sound-records, comprising the combination with a revoluble mandrel, and a carriage traveling parallel therewith, of a shaving-knife mounted on said carriage and having its axis at right angles to said mandrel-axis and itself lying in a diagonal plane, and means for pivotally adjusting said knife in said diagonal plane while in operation.

4. A shaving-machine for cylindrical sound-records, comprising the combination with a revoluble mandrel, and a carriage traveling parallel therewith, of a shaving-knife mounted on said carriage and having its axis at right angles to said mandrel-axis and itself lying in a diagonal plane, means for adjusting said knife longitudinally while in operation, and additional means for pivotally adjusting said knife in said diagonal plane while in operation.

5. A shaving-machine for cylindrical sound-records, comprising the combination with a revoluble mandrel, and a carriage traveling parallel therewith, of a horizontal knife-bar mounted transversely upon said carriage and adjustable longitudinally thereof while in operation, and having a diagonally-arranged longitudinal slot in its forward end, a knife-holder and knife pivotally seated in said slot, and means for adjusting the same pivotally while in operation.

6. A shaving-machine for cylindrical sound-records, comprising a tapering revoluble mandrel, and a shaving-knife carried parallel with the axis of said mandrel and

operating solely in the direction from the smaller to the larger end thereof.

7. A shaving-machine for cylindrical sound-records, comprising the combination of a tapering revoluble mandrel, and a shaving-knife located adjacent that side of said mandrel which is rotating upward and traveling parallel with said mandrel and operating solely in the direction from the smaller to the larger end thereof.

8. A shaving-machine for cylindrical sound-records, comprising the combination with a revoluble mandrel, and a carriage traveling parallel therewith and provided with a transverse bore and a transverse screw-threaded seat, of a headed knife-bar located in said bore and having at its forward end a diagonally-arranged longitudinal slot, a screw engaging said seat and the head of said bar respectively, and a shaving-knife mounted pivotally in said slot.

9. A shaving-machine for cylindrical sound-records comprising the combination with a revoluble mandrel, and a carriage traveling parallel therewith and provided with a transverse bore and a transverse

screw-threaded seat, of a headed knife-bar located in said bore and having at its forward end a diagonally-arranged slot, a screw engaging said seat and the head of said bar respectively, a shaving-knife mounted pivotally in said slot, and means for permitting adjustment of said knife upon said pivot while in operation.

10. A shaving-machine for cylindrical sound-records, comprising the combination with a revoluble mandrel, and a carriage traveling parallel therewith, of a horizontal knife-bar mounted transversely upon said carriage and provided with a seat at its forward end, a knife pivotally mounted in said seat and provided with an exposed notch at its rear end, whereby said knife can be adjusted pivotally while in operation.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS H. MACDONALD.

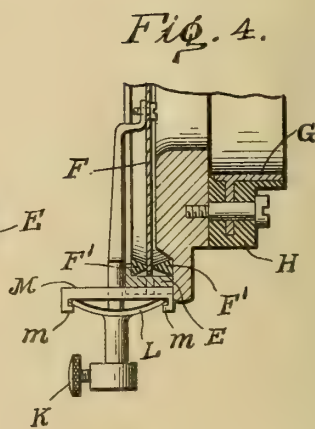
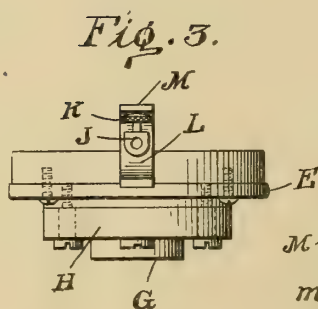
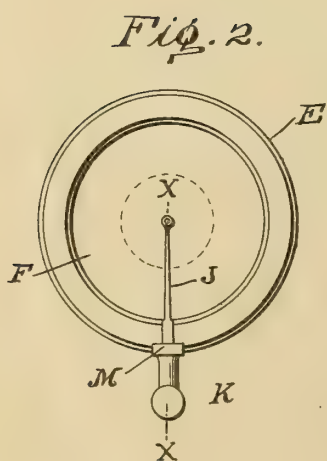
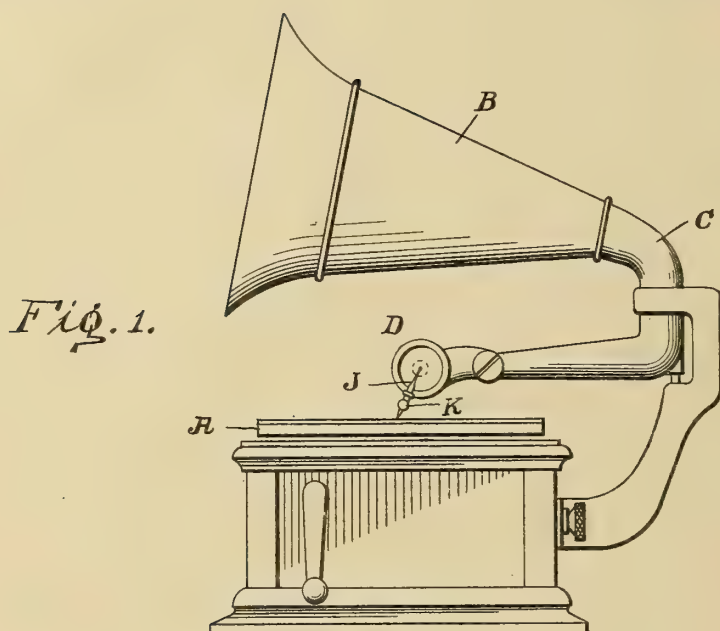
Witnesses:

A. B. KEOUGH,
L. B. NICHOLSON.

R. L. GIBSON.
SOUND BOX FOR TALKING MACHINES.
APPLICATION FILED NOV. 28, 1905.

990,973.

Patented May 2, 1911.



WITNESSES:
W. Webster, Jr.
R. M. Kelly.

INVENTOR
Robert L. Gibson
BY J. M. Smith
Attorney

UNITED STATES PATENT OFFICE.

ROBERT L. GIBSON, OF PHILADELPHIA, PENNSYLVANIA.

SOUND-BOX FOR TALKING-MACHINES.

990,973.

Specification of Letters Patent.

Patented May 2, 1911.

Application filed November 28, 1905. Serial No. 289,410.

To all whom it may concern:

Be it known that I, ROBERT L. GIBSON, of the city and county of Philadelphia, State of Pennsylvania, have invented an Improvement in Sound-Boxes for Talking-Machines, of which the following is a specification.

My invention relates particularly to the means for supporting the stylus bar, and its object is to increase the sensitiveness and volume of the sounds transmitted without decreasing their timbre and sharpness.

In another application, Serial No. 284,646, filed October 27th, 1905, I have described a stylus bar support consisting of a spring structure arranged at right angles to the plane of the diaphragm of the sound box, and the present invention relates to a supporting device of this general character.

More particularly the present invention relates to the employment in a supporting device of this kind of a leaf or flat spring supported at its ends transversely to the plane of the diaphragm and connected with the stylus bar between its ends, so that, while great sensitiveness to direct vibration in the plane of the diaphragm is preserved, the resistance to lateral or torsional movement is increased. Not only is the construction beneficial in increasing the amplitudes and accuracy of the sound transmitted, but it is simple, economical and easily applied.

In the drawings: Figure 1 is an elevation of a talking machine embodying the invention; Fig. 2 is a front elevation of the sound box; Fig. 3 is an elevation of the upper edge of the sound box; and Fig. 4 is a transverse sectional view on the line X-X of Fig. 2 enlarged.

A is the rotating record carrying disk or table; B is the horn; C is the swinging sound conveying arm; and D is the sound box suspended from the arm, with which it may be connected in any suitable manner.

While the particular construction of the sound box, aside from the stylus bar support is not material to my invention, I have, for purposes of illustration, shown a sound box of the general character shown in the Jones Patent No. 628,813, dated July 11th, 1899, in which the diaphragm F is clamped between flexible rings F' F' with in the head E of the sound box, and the tubular sleeve of the head G is clamped between rings H H of non-sound conducting material. The stylus bar J is secured at one end to the center of the diaphragm F

in the usual manner and is provided at the other end with a clamp K of any convenient construction, for holding the stylus or needle point.

The support for the stylus bar consists of a flat spring L, arranged transversely to the plane of the diaphragm and supported by the head. It is connected with the stylus bar between its ends. In the construction shown, M is a frame carried by the head of the sound box and having notches *m m* into which the ends of the spring L are sprung, thereby curving the spring and putting it under tension. The bar J extends through the spring and frame M and may be secured to the former in any suitable manner, as by solder. With a spring support of this kind extending transversely to the plane of the diaphragm, and hence to the plane of vibration of the point of connection between the stylus bar and diaphragm the stylus bar is made very sensitive to the direct vibration, while lateral or torsional vibration is practically eliminated and this resistance to lateral or torsional movement is greatly increased by the use of the flat spring. This support, therefore, by reason of its sensitiveness to direct vibration and of its resistance to lateral or torsional movement transmits the sound waves with great amplitude and accuracy, and not only increases the volume but preserves the timbre and tone.

While it is not new to connect the bar to a spring supported at its ends and arranged transversely to the plane of the diaphragm, in former constructions of this kind the spring is not the sole means of supporting and sustaining the stylus bar, but is the means of holding the stylus bar on a fulcrum between a portion of the stylus bar and the head upon which the bar vibrates. In my construction the spring acts not as a means of holding the bar upon a stationary fulcrum but as the sole means of supporting the bar and the usual stationary fulcrum is dispensed with. The bar vibrates at the point of connection with the spring and rest on a stationary or fixed fulcrum.

What I claim as new and desire to secure by Letters Patent, is as follows:

1. In a sound box for talking machines, the combination of a head or rim and diaphragm, a substantially rectangular flat spring supported at its opposite ends only, said sole points of support and the spring being in a line transverse to the plane of the

diaphragm, and a stylus bar connected with the spring between the ends thereof, said spring having the function of a fulcrum and yieldingly supporting and holding said bar in its normal position.

2. In a sound-box for talking machines, the combination of a head or case and diaphragm, a substantially rectangular flat spring bent transversely to its length so as to be under tension and supported at its opposite ends only, said sole points of support and the spring being in a line transverse to the plane of the diaphragm, and a stylus bar connected with the spring between and in line with the ends thereof, said spring having the function of a fulcrum and yieldingly supporting and holding said bar in its normal position.

3. In a sound-box for talking machines, the combination of a head or case and diaphragm, a supporting frame carried by the case having two oppositely directed shoulders, a substantially rectangular flat spring supported at its opposite ends only by the shoulders of said frame, said sole points of support of the frame and the spring being in a line transverse to the plane of the diaphragm, and a stylus bar connected with the spring between the ends thereof, said spring having the function of a fulcrum and yieldingly supporting said bar in its normal position.

4. In a sound box for talking machines,

the combination of the head or case and diaphragm, of a transverse supporting frame M carried by the head and arranged transversely to the plane of the diaphragm, the flat spring L having its ends sprung into engagement with said support and extending transversely to the plane of the diaphragm and a stylus bar acting on the diaphragm and connected with said spring.

5. In a sound-box, a case having two supports arranged parallel to and at different distances from the diaphragm, a diaphragm located to one side of a plane through said supports, a flat spring sprung between the supports so as to be under tension and in a plane at right angles to the plane of the diaphragm, and a stylus secured to the spring intermediate of its ends and supported wholly by the spring and out of direct contact with the case.

6. In a sound box, the combination with a stylus, of a spring support therefor, and a spring supporting plate, the ends of said spring support being secured to the plate, and the central portion of said spring support being sprung away from the said plate.

In testimony of which invention, I hereunto set my hand.

ROBERT L. GIBSON.

Witnesses:

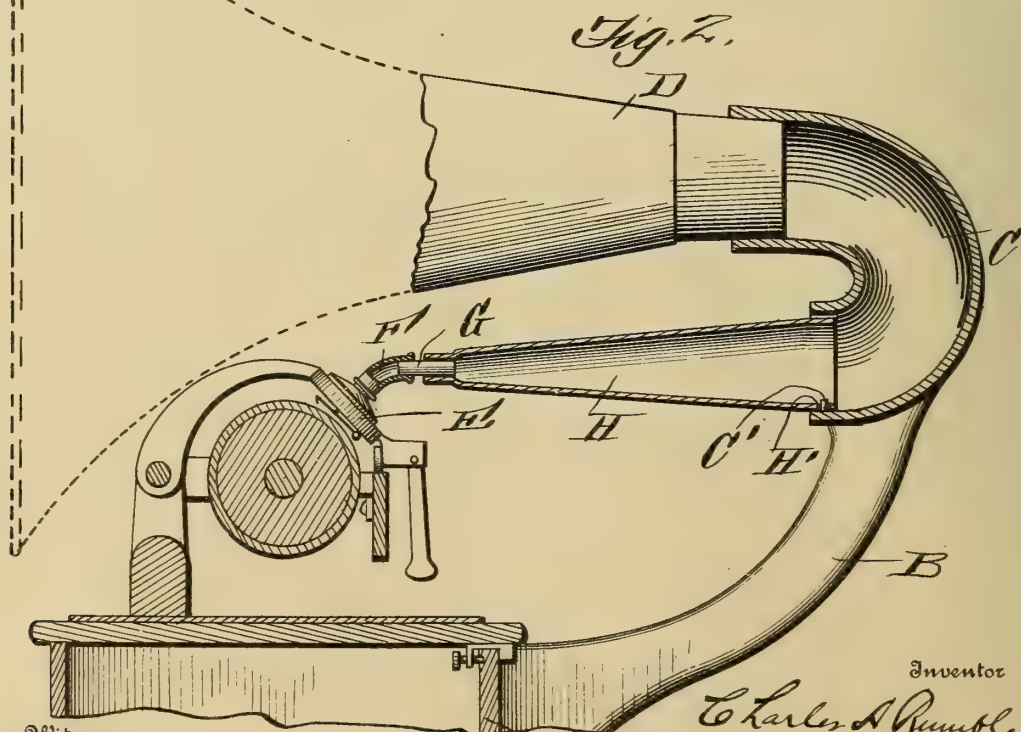
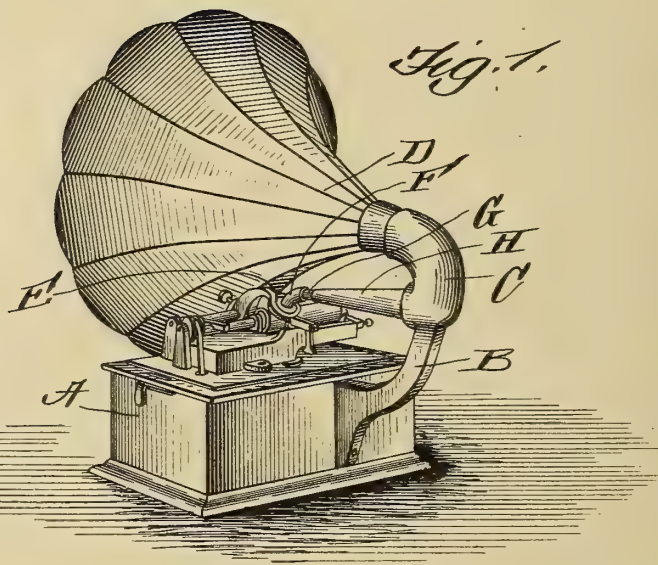
R. M. KELLY,
M. J. EYRE.

C. A. RUMBLE.
ATTACHMENT FOR PHONOGRAPHS.
APPLICATION FILED SEPT. 11, 1906.

991,090.

Patented May 2, 1911.

2 SHEETS—SHEET 1.

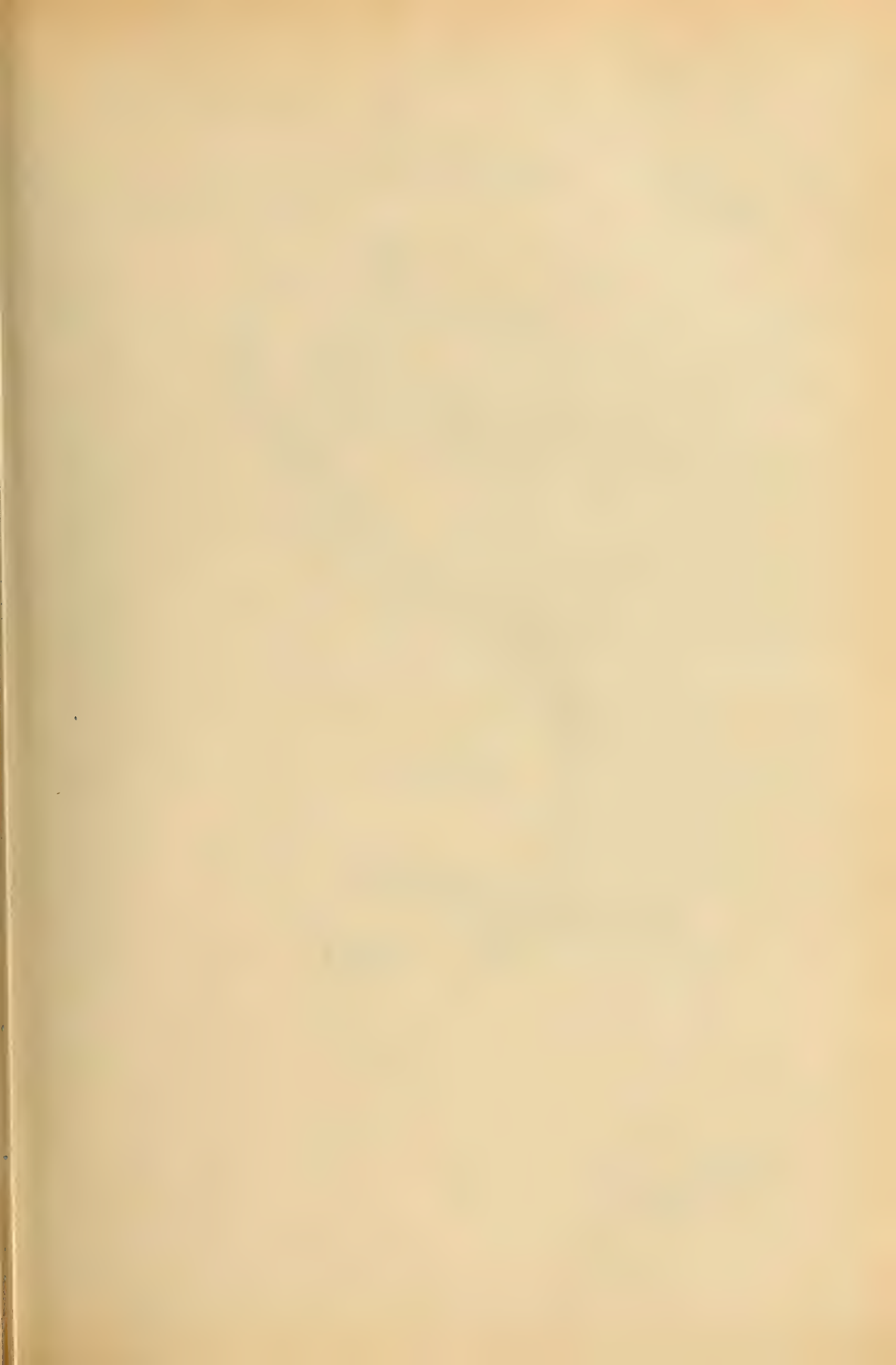


Witnesses

Wm. B. Brown.
Edw. R. Fowler

By

Inventor
Charles A. Rumble
A. L. Hough.
Attorney

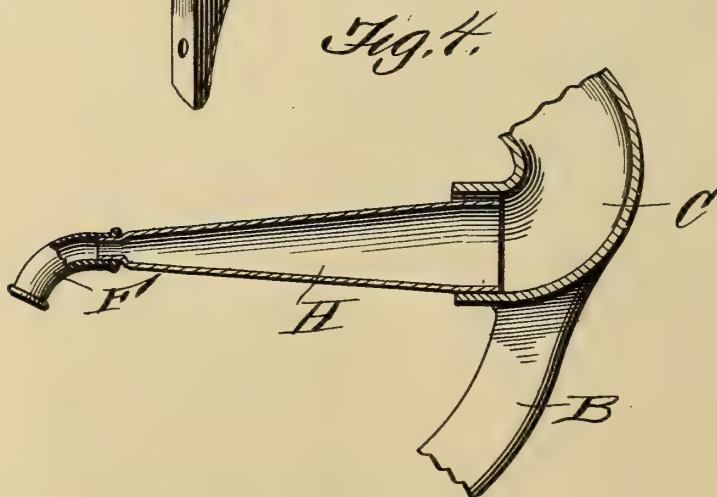
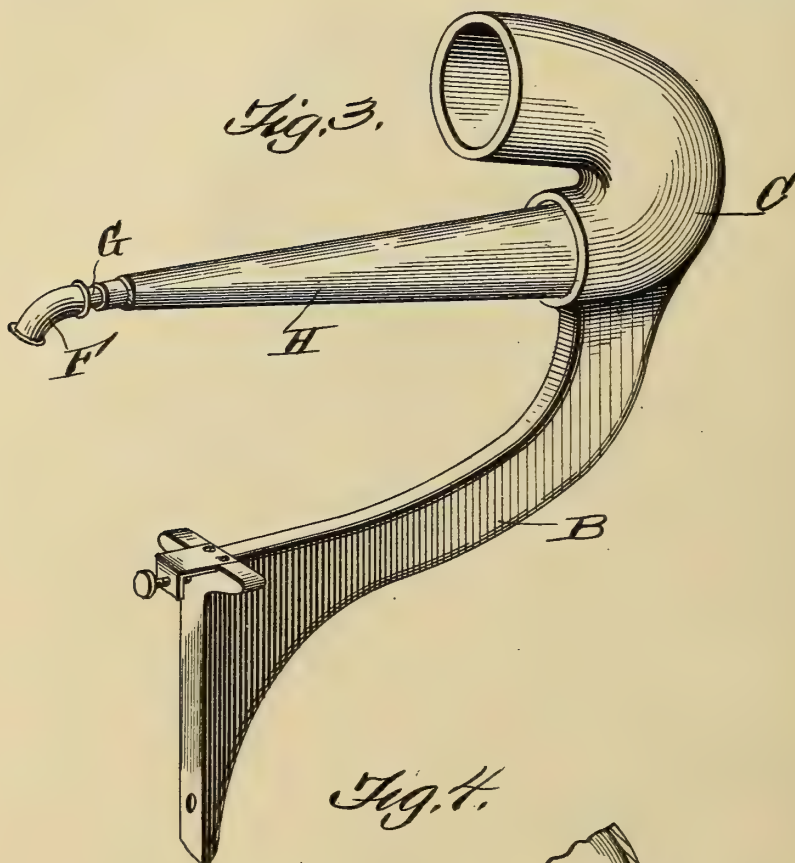


C. A. RUMBLE.
ATTACHMENT FOR PHONOGRAPHS.
APPLICATION FILED SEPT. 11, 1906.

991,090.

Patented May 2, 1911.

2 SHEETS—SHEET 2.



Witnesses

R. A. Rumble
Adm. R. Rumble

By

Inventor
Charles A. Rumble
A. L. Hough
Attorney

UNITED STATES PATENT OFFICE.

CHARLES A. RUMBLE, OF LOWVILLE, NEW YORK, ASSIGNOR TO AMERICAN GRAPHOPHONE COMPANY, OF BRIDGEPORT, CONNECTICUT, A CORPORATION OF WEST VIRGINIA.

ATTACHMENT FOR PHONOGRAPHS.

991,090.

Specification of Letters Patent.

Patented May 2, 1911.

Application filed September 11, 1906. Serial No. 334,173.

To all whom it may concern:

Be it known that I, CHARLES A. RUMBLE, a citizen of the United States, residing at Lowville, in the county of Lewis and State of New York, have invented certain new and useful Improvements in Attachments for Phonographs, &c.; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

This invention relates to new and useful improvements in attachments to phonographs and graphophones, and especially in the provision of a means for connecting the reproducer to the horn, and utilized especially upon cylinder machines, and the object of the invention is to produce a simple and efficient connection between the reproducer and horn holder and so arranged that the connection may have a free movement corresponding to the movement of the reproducer.

My invention comprises various details of construction and arrangements of parts which will be hereinafter fully described and then specifically defined in the appended claims.

The inventive idea may be embodied in a variety of mechanical structures, some of which, for the purpose of illustrating the invention, are shown in the accompanying drawings, in which—

Figure 1 is a perspective view showing the manner of attachment of my invention to a talking machine. Fig. 2 is a vertical sectional view through the horn supporter and connection between the same and the reproducer. Fig. 3 is a perspective view of the horn support, the flexible tube for connection with the reproducer, and the tapering tone-arm which connects the horn support with the flexible tube, and Fig. 4 is a sectional view showing another form of my invention.

Reference now being had to the details of the drawings by letter, A designates the casing of an ordinary talking machine of the cylinder type, and B is a bracket arm which is fastened to the casing in any suitable manner. The upper portion of said

bracket arm has a curved shell C integral therewith, to the upper end of which a horn D is adapted to be fastened in such a manner that the horn will overhang the top of the case. The reproducer E has connected thereto a flexible pipe F, in the other end of which a tube G is fitted, being held in place by friction intermediate the two contact surfaces, and the opposite end of said tube G has a free movement in the tapering end of the tone-arm H, the large end of which is inserted in the lower end of the shell C.

C' designates a pivot pin projecting from the inner surface of the shell C adjacent to one of the openings therein, and the tone-arm H has a perforation H' adjacent to its enlarged end which enters the shell, which perforation is adapted to receive said pin C' upon which it is adapted to have a universal pivotal movement.

In Fig. 4 of the drawings, I have shown another form of my invention, in which the tube G is dispensed with and the small end of the tone-arm H is fitted within the flexible pipe F and held from movement therein by frictional contact between the two ends, while the enlarged end of the tone-arm H enters the lower opening in the shell and has a free movement therein, thus giving the tone-arm a universal movement incident to the movement of the reproducer and dispensing with the pivotal connection, before described.

From the foregoing, it will be seen that a simple and efficient connection is afforded between the reproducer and the horn-supporting bracket in a machine employing a cylindrical record, the connection being such that the tone arm may be turned in any direction, while its end nearest the reproducer affords the free movement necessary to compensate for the variation in distance from the reproducer stylus to the point where the tone arm is connected to the horn. Moreover, by this construction the horn is supported in a position where it will not interfere with the handling of the record, nor with the general manipulation of the machine.

What I claim is:

1. In a talking machine, a bracket arm secured to the casing of the machine and provided with a hollow shell to receive a horn, a hollow tone arm connected to said

hollow shell by a pin or lug formed on one of said members and entering a hole or opening in the other, a reproducer and telescopic connections between said reproducer and
5 said tone-arm.

2. In a talking machine, a bracket-arm secured to the casing of the machine and provided with a hollow shell to receive the horn, a lug projecting from the inner wall
10 of the shell adjacent to its lower end, a tapering tone-arm having an aperture in its wall adjacent to one end and adapted to receive said lug, an open-ended tube adapted to telescope with the contracted end of said
15 tapering tone-arm, a reproducer and a flexible pipe connecting the same to said tube.

3. In a talking machine, a bracket-arm secured to the casing of the machine and provided with a hollow shell to receive a horn,
20 a lug projecting from the inner wall of the shell adjacent to its lower end, a tone-arm having an aperture in its wall adjacent to its enlarged end and adapted to receive said lug, thereby affording a universal joint between
25 said tone-arm and said shell, an open-ended tube adapted to be removably held within the contracted end of the tone-arm, a reproducer and flexible connections between the same and said tone-arm.

30 4. A talking machine comprising a frame,

a mandrel on said frame, a record on said mandrel, a reproducer carriage mounted to move in a right line parallel with the axis of said mandrel, a reproducer supported by
35 said carriage with its stylus in contact with said record, a tubular extension projecting from said reproducer, a fixed support, an amplifying horn mounted at its small end upon said support, and a hollow tone arm
40 swingingly supported by said fixed support, communicating with said horn and having telescopic engagement with said tubular extension projecting from said reproducer.

5. In a talking machine, a sound record, a reproducer in operative engagement there-
45 with, a tubular extension projecting from said reproducer, a fixed support, an amplifying horn mounted at its small end upon said support, a hollow tapering tone-arm swingingly supported by said fixed sup-
50 port at its larger end and communicating with said horn, and having sliding telescopic engagement with said tubular extension projecting from said reproducer.

In testimony whereof I hereunto affix my
55 signature in presence of two witnesses.

CHARLES A. RUMBLE.

Witnesses:

CHARLES S. MERENESS,

CHARLES S. MERENESS, Jr.

A. N. PIERMAN.
 PHONOGRAPH REPRODUCER.
 APPLICATION FILED SEPT. 18, 1909.

991,361.

Patented May 2, 1911.

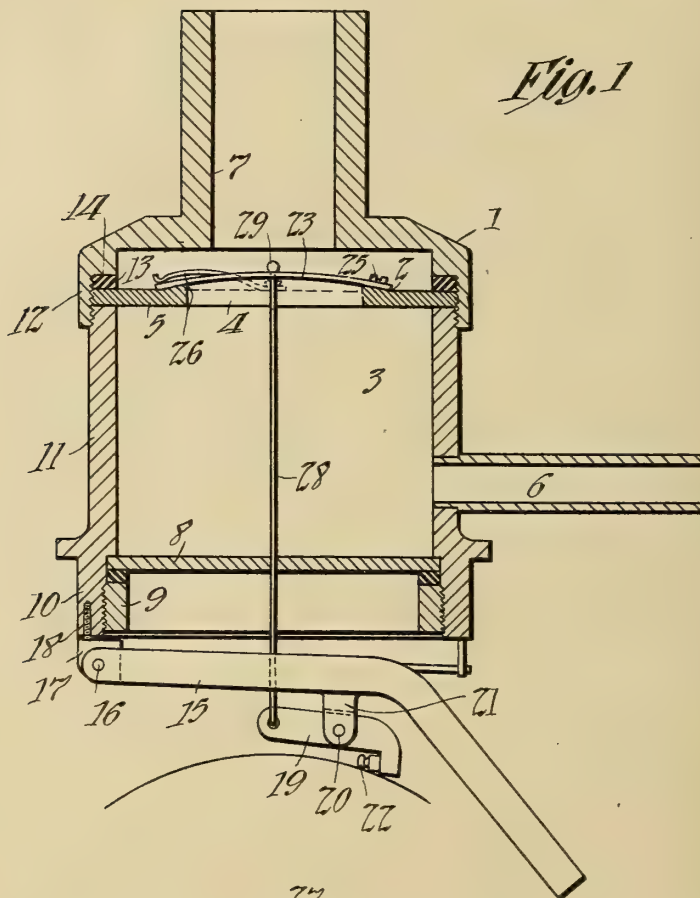
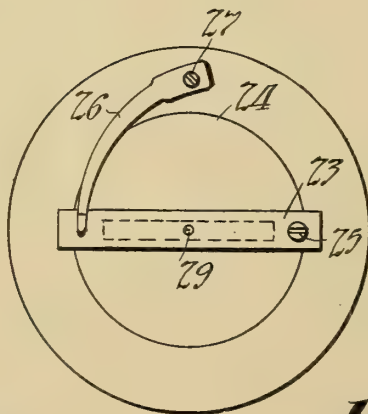


Fig. 1

Fig. 2



Witnesses:

Frank D. Lewis
Dyer Smith

Inventor:

Alexander A. Pierman
by Frank T. Rye
Atty.

UNITED STATES PATENT OFFICE.

ALEXANDER N. PIERMAN, OF NEWARK, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

PHONOGRAPH-REPRODUCER.

991,361.

Specification of Letters Patent.

Patented May 2, 1911.

Application filed September 18, 1909. Serial No. 518,413.

To all whom it may concern:

Be it known that I, ALEXANDER N. PIERMAN, a citizen of the United States, and a resident of Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Phonograph-Reproducers, of which the following is a description.

My invention relates to phonograph reproducers of the pneumatic type, or, generally speaking, of the type in which undulations corresponding to sound waves are impressed upon a current of any suitable moving fluid by the operation of a suitable valve through which the fluid is allowed or caused to pass, the valve being operated in accordance with the sound waves as by connection with a reproducing stylus tracking a record groove.

The object of my invention is to improve the quality of sound reproduction of a device of this character by the production of a novel valve structure, the valve being extremely thin, very flexible, and of considerable weight, so that defects due to momentum and inertia of parts are avoided and a more faithful reproduction obtained.

Other objects of my invention are the construction of parts and combinations of elements necessary or desirable for the attainment of the above mentioned object, as more particularly pointed out in the following specification and claimed in the appended claims.

Reference is hereby made to the accompanying drawings forming part of this specification, illustrating a preferred embodiment of my invention, in which—

Figure 1 is a central vertical section through a phonograph reproducer embodying my invention, certain parts being shown in side elevation; and Fig. 2 is a plan view of the port plate with the valve mounted thereon and covering the port.

Referring to the drawings, the sound box 1 may be formed with two chambers 2 and 3 communicating through the port 4 in the port plate 5, air being conducted into the chamber 3 by means of a conduit 6 and escaping from the chamber 2 through the reproducer neck 7. The chamber 3 is closed by the closure 8 which is secured in position against a shoulder formed in the circular wall of the chamber 3 by means of the ring 9 which is screwed into the depending flange

10 of the cylinder 11 which is screwed within the depending flange 12 formed integral with the reproducer neck 7. The port plate 5 is secured in position between the upper surface of cylinder 11 and gasket 13, which is forced into close contact with shoulder 14 within flange 12 when members 11 and 12 are screwed together. The floating weight 15 is pivotally mounted at 16 to the block 17 which is mounted as by screw 18 on the lower surface of the depending flange 10. The stylus lever 19 is pivotally mounted at 20 to the lugs 21 depending from the floating weight 15 and the said stylus lever is provided with stylus 22, all of the above mentioned parts being common.

The port 4, which is preferably in the form of a lengthened slit as shown, is normally closed by means of the valve member 23 seated upon the port plate 5 to cover the port 4. The valve member 23 is extremely thin, being preferably formed of any suitable sheet metal rolled to a thickness of from one to two one-thousandths of an inch. I have found it impossible to cause material of such excessive thinness to lie evenly upon a flat surface, since the tendency to curl or become deformed locally out of contact with the surface upon which it is placed is unavoidable. Such a thin film or sheet can, however, be placed upon a convexly curved surface and can be stretched or held under pressure upon the same so that it will conform closely to the curved surface and fit accurately upon the same without deformation throughout its whole area. I have applied this principle to the thin valve member of my present invention, and am enabled thereby to make use of a valve member having the characteristics above described. Accordingly, the port plate 5 is formed upon its upper surface with a regularly curved convex surface 24, this curved surface preferably having the periphery of a circle, the slit or lengthened port 4 having its upper orifice located within the same and extending along the diameter of the circle. The valve member 23 is secured to the port plate at one of its ends by any suitable means, as the screw 25 which is located at one edge of the swelling or curve 24. The other end of valve 23 rests upon the curved surface 24 beyond the end of port 4, yielding means as the spring 26 secured to port plate 5 by any suitable means as the screw 27 being em-

ployed to press upon this end of valve 23 and normally retain the same in position upon its seat. Spring 26 tends to counter-balance the pressure of the air or other fluid admitted into chamber 3 from conduit 6, so that when the fluid is admitted the valve is raised slightly from its seat to allow a slight normal leak of the fluid from the port. Spring 26 also performs the function of overcoming the tendency of the thin material of which valve 23 is formed to curve or become distorted, and holds the same accurately in contact throughout its length with its curved seat. Valve 23 is connected by means of link 28 to the tail of stylus lever 19, whereby the movements of stylus 22 in tracking the sound record to be reproduced are accurately reproduced by the vibration of valve 23, the extent of the opening of port 4 being varied according to undulations impressed upon the current of fluid moving through port 4, these undulations corresponding faithfully with the undulations of the record groove being tracked by the stylus 22.

In the construction shown, link 28 extends through a central orifice in valve 23 and is connected thereto by the ball or upset end 29 on the top of link 28, forming a one-way connection, although it is obvious that link 28 might be rigidly connected to valve 23 if desired. With the construction shown, the movement of stylus 22 over elevations in the sound record results in the depression of valve 23 against the fluid pressure, while the movement of stylus 22 in tracking depressions in the sound record permits the fluid pressure upon the lower surface of valve 23 to raise the same to the greatest extent permitted by ball 29.

It is obvious that, if desired, suction might be employed instead of compression for carrying the moving fluid through the sound box, in which case, curved surface 24 would be located upon the lower surface of plate 5 and valve 23 seated thereupon. It is also obvious that, if desired, a plurality of ports 4 might be employed, each with its corresponding valve 23.

Having now described my invention, what I claim and desire to protect by Letters Patent is as follows:

1. In a phonograph reproducer, the combination with a body containing chambers communicating through a port, of a port plate in which said port is formed, a portion of one surface of said plate adjacent to an opening of said port being curved, an extremely thin valve member of elastic material seated snugly upon said curved surface and covering said port, and means for

vibrating said member to uncover the said port to a greater or less extent in accordance with sound vibrations, substantially as described.

2. In a phonograph reproducer, the combination of a port plate having a regularly curved surface and having a port extending therethrough with one orifice thereof situated in said surface, and a valve member seated upon said port and conforming closely to said surface, substantially as described.

3. In a phonograph reproducer, the combination with a body containing chambers communicating through a port, of a port plate in which said port is formed, a portion of one surface of said plate being regularly curved, one orifice of said port being situated in said curved surface, an extremely thin valve member of elastic material seated upon said surface and conforming closely thereto when at rest, and covering said port, and means for flexing said member to uncover said port to a greater or less extent in accordance with sound vibrations, substantially as described.

4. In a phonograph reproducer, the combination with a body containing chambers communicating through a port, of a port plate in which said port is formed, a portion of one surface of said plate being regularly curved, one orifice of said port being situated in said curved surface, an extremely thin valve member of elastic material seated upon said surface and conforming closely thereto when at rest, and covering said port, means for introducing fluid under pressure within one of said chambers, means tending to hold said valve on its seat against the pressure of said fluid, and means for flexing said member to uncover said port to a greater or less extent in accordance with sound vibrations, substantially as described.

5. In a phonograph reproducer, the combination of a port plate having one surface formed with a regularly curved portion and having a port extending therethrough with one orifice thereof situated in said curved surface, an extremely thin flexible valve member seated upon said port and conforming closely to said surface, means securing said member in position, and yielding means tending to hold said member on its seat, substantially as described.

This specification signed and witnessed this 16th day of September 1909.

ALEXANDER N. PIERMAN.

Witnesses:

DYER SMITH,
JOHN M. CANFIELD.

991, 424

UNITED STATES PATENT OFFICE.

CHARLES P. CARTER, OF KINGSTON, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS,
TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A COR-
PORATION OF NEW JERSEY.

PHONOGRAPH-REPRODUCER.

991,424.

Specification of Letters Patent.

Patented May 2, 1911.

Application filed September 20, 1909. Serial No. 518,575.

To all whom it may concern:

Be it known that I, CHARLES P. CARTER, a citizen of the United States, and a resident of Kingston, in the county of Ulster and State of New York, have invented certain new and useful Improvements in Phonograph-Reproducers, of which the following is a description.

My invention relates to phonograph reproducers of the Edison type in which a floating weight is pivoted to the body of the reproducer and the stylus is carried by a lever pivoted to the floating weight and connected to a reproducer diaphragm or other means for producing sound vibrations.

My invention has for its object the mounting of the said lever in such a way that the stylus shall be free to move up and down and also horizontally or laterally in order to follow the sound record groove faithfully. I mount the lever upon a horizontal pivot pin in such a manner that the stylus lever is free not only to rock about the said pin in a vertical plane in tracking the sound record groove, but also to rock about the said pin in a horizontal plane and also to move bodily laterally upon the said pin in following the irregularities of the record groove. My construction also employs an elastic or spring means for maintaining the stylus lever centrally in alinement with the record groove and for returning the lever to said position after deviation therefrom and for restraining its lateral movement upon the pivot pin.

Reference is hereby made to the accompanying drawings of which—

Figure 1 is a central vertical section of a phonograph reproducer constructed in accordance with my invention, certain parts being shown in elevation. Fig. 2 is a bottom plan view of the same, certain parts being shown in section; and Fig. 3 is a detail view similar to Fig. 2 of a modified form of my device.

The reproducer shown comprises the usual body 1 within which the diaphragm 2 is clamped between gaskets 3 by means of the usual clamping nut 4. The floating weight 5 is pivoted at 6 to a block 7 having a shank 8 threaded within the body 1. The floating weight in the form of my invention shown in Figs. 1 and 2 is provided with a pair of depending lugs 9 and 10 within which is se-

cured the horizontal pivot pin 11 upon which stylus lever 12 is mounted. Lever 12 carries stylus 13 and is connected to diaphragm 2 by means of link 14. Lever 12 is mounted upon pin 11 in such a way as to be free to pivot upon the same in a horizontal plane. I accomplish this by providing lever 12 with a bearing surface for pin 11 which closely fits the same only at a central longitudinal section of the lever 12. That is, the lever 12 is given as nearly as possible merely a point contact upon pin 11 so that the lever is free to rock in a horizontal direction. This is accomplished by enlarging the hole in lever 12 through which pin 11 passes from the central section of the lever toward the two sides of the lever, as is shown in Figs. 2 and 3 of the drawings. This enlargement of the hole results in giving the latter an elliptical or circular shape at the two openings of the orifice upon the sides of the lever, these openings being, of course, greater in diameter than the pin 11, the diameter of the hole midway between the two sides of the lever, however, fitting the pin 11 closely so that lengthwise movement of lever 12 is prevented.

In the form of my invention shown in Fig. 2 the lug 10 is some distance to one side of lever 12, spiral spring 15 being coiled around pin 11 between lug 10 and the adjacent side of lever 12. A washer 16 may be interposed between spring 15 and lever 12. As shown, lever 12 normally rests against lug 9, but may move from such position against the pressure of spring 15. If desired, it is of course obvious that a spring similar to 15 might be interposed on both sides of lever 12, but I do not consider this construction desirable or necessary.

In the modification shown in Fig. 3, a leaf spring 17 is used in place of the spiral spring. In this case lever 12 is mounted as before upon pin 11, an elongated washer or sleeve 18 preferably being mounted upon the extension of pin 11 to one side of lever 12, the end of leaf spring 17 being provided with an opening through which the end of pin 11 is passed, spring 17 thus bearing directly upon the end of sleeve 18. If desired, it is, of course, obvious that spring 17 might bear directly against the side of lever 12.

Having now described my invention, what

I claim and desire to protect by Letters Patent is as follows:

1. In a sound reproducer, the combination of a body, a floating weight carried thereby, a horizontal pin carried by the floating weight, a stylus lever pivoted upon said pin and free to move bodily thereon axially of the same, a stylus carried by said lever, said pin projecting to one side of said lever and yielding means arranged to press against the side of said lever and resiliently resist lateral movement thereof upon said pin, substantially as described.

2. In a sound reproducer, the combination of a body, a floating weight carried thereby, a horizontal pin carried by the floating weight, a stylus lever pivoted upon said pin, a stylus carried by said lever, said lever being provided with an opening from side to side through which said pin passes provided with a close fitting bearing surface for said pin at the section of said lever midway between the two side surfaces thereof only, and yielding means tending to maintain said lever in a central position, substantially as described.

3. In a sound reproducer, the combination of a stylus lever, a horizontally disposed pin upon which said lever is pivoted said pin extending through said lever from side to side and being longer than the width of said lever and said lever being free to move laterally upon said pin, fixed means upon one side of said lever, and yielding means upon the other side of said lever, arranged to restrain lateral movement of said lever upon said pin, substantially as described.

4. In a sound reproducer, the combination of a stylus lever, a horizontally disposed pin

upon which said lever is pivoted said pin extending through said lever from side to side and being longer than the width of said lever, and said lever being free to move laterally upon said pin, and yielding means laterally disposed to said lever arranged to restrain lateral movement of said lever upon said pin, substantially as described.

5. In a sound reproducer, the combination of a stylus lever, a horizontally disposed pin upon which said lever is pivoted longer than the width of said lever, said lever being provided with an opening from side to side through which said pin passes having a close fitting bearing surface for said pin at the section of said lever midway between the two side surfaces thereof only, and said lever being free to move bodily laterally upon said pin, substantially as described.

6. In a sound reproducer, the combination of a stylus lever, a horizontally disposed pin upon which said lever is pivoted longer than the width of said lever, said lever being provided with an opening from side to side through which said pin passes having a close fitting bearing surface for said pin at the section of said lever midway between the two side surfaces thereof only, said lever being free to move laterally upon said pin, and yielding means arranged to press laterally upon said lever to restrain such movement, substantially as described.

This specification signed and witnessed this 17th day of Sept. 1909.

CHARLES P. CARTER.

Witnesses:

JNO. B. ALLIGER,
JAMES J. O'CONNOR.

192, 527

J. MORTON.
SOUND RECORDING AND REPRODUCING INSTRUMENT.
APPLICATION FILED FEB. 13, 1911.

992,029.

Patented May 9, 1911.

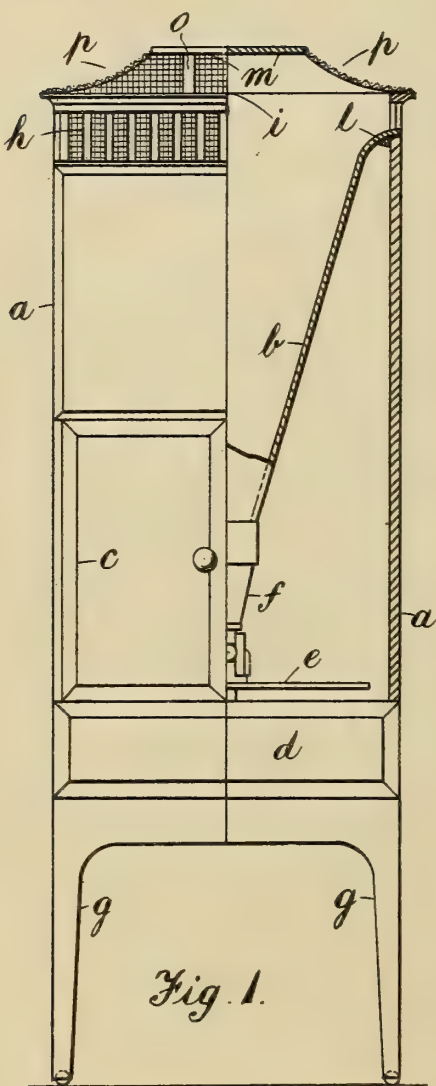


Fig. 1.

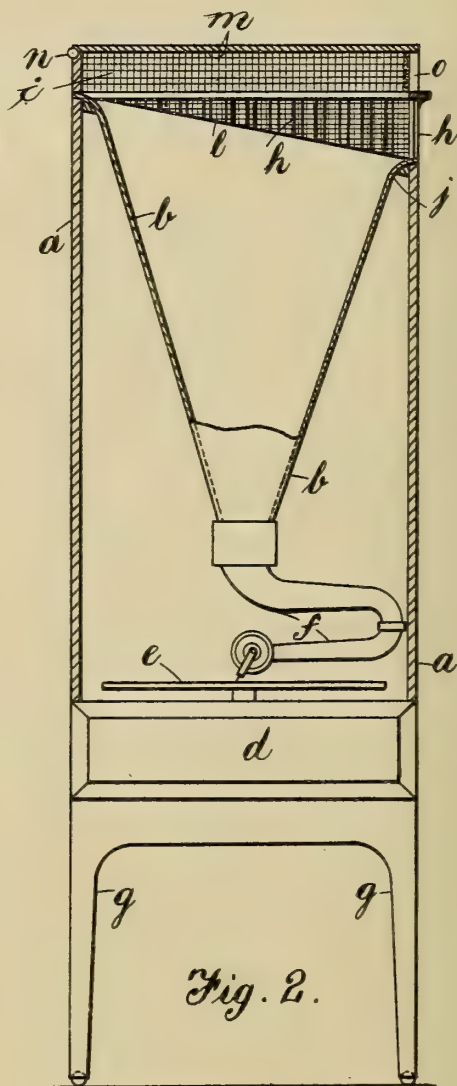


Fig. 2.

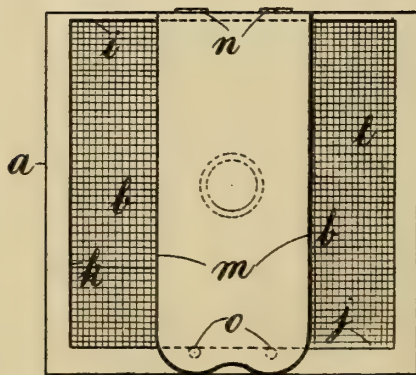


Fig. 3.

Witnesses
H. J. McChesney
J. E. Spusta.

Inventor
Josephine Morton
By William J. Fike
Sol Witherspoon
Attorneys

UNITED STATES PATENT OFFICE.

JOSEPHINE MORTON, OF LONDON, ENGLAND, ASSIGNOR TO MELVIN WILLIAMS & CO., LTD., OF CARDIFF, ENGLAND, A CORPORATION OF GREAT BRITAIN.

SOUND RECORDING AND REPRODUCING INSTRUMENT.

992,029.

Specification of Letters Patent.

Patented May 9, 1911.

Application filed February 13, 1911. Serial No. 608,251.

To all whom it may concern:

Be it known that I, JOSEPHINE MORTON, a subject of the King of Great Britain, residing at 33 Fumival street, London, in the county of Middlesex, England, have invented a new and useful Improvement in or Relating to Sound Recording and Reproducing Instruments, of which the following is a specification.

This invention relates to sound recording and reproducing instruments such as gramophones, phonographs and the like, and it has more particular reference to the construction of the cabinets for containing the entire mechanism, and which are provided with vertically arranged trumpets having their flared mouths directed toward fretwork covered sound openings in the casing. Instruments of the kind referred to usually have one or more trumpets branching from the sound pipe vertically to the top of the inclosing cabinet; said trumpet or trumpets being fitted at or near their ends with sounding boxes for the intensification and mellowing of the reproduction; or with bridge pieces near the mouth for transmitting the vibrations of the wider part of the trumpet to the casing without the vibrations of the narrower part affecting the strengthening and refining of the sound.

One feature of my invention is to provide an improved construction of gramophone or phonograph cabinet of the foregoing type which is fitted with a novel sound diffuser or deflector.

A further feature of my invention consists in the particular method of forming and arranging the mouth of the trumpet relative to its longitudinal axis or the sound pipe and inclosing cabinet whereby the sounds reproduced are much more effectively diffused instead of being projected in one or more definite and distinct directions.

The accompanying drawing is in illustration of my invention. Figure 1 being a front elevation, partly in section, of one convenient embodiment of the present improvements; Fig. 2 is a central vertical section taken at right angles to Fig. 1, and Fig. 3 is a plan view.

According to the illustrated way of carrying my invention into effect I construct a wooden or other suitable cabinet *a*, rectangular in plan and of a sufficient depth to

contain the sound recording and reproducing mechanism as well as the trumpet *b*, and provide it with a door or doors *c* for giving access thereunto. In the drawing the mechanism is arranged in a compartment *d*, below the record carrier *e*, and *f* is the sound arm and connection to the trumpet *b*. This cabinet is provided with legs *g*, *g*, of any desired shape and height, or a stand may be used for supporting the cabinet, and for an appropriate depth from the upper edge of the cabinet around three of its sides—for example—I form openings or sound apertures of any of the well known types, but preferably I fit these openings with fretwork or the like *h*, *h*, behind which I arrange fine silk to give a finished appearance to the entire cabinet.

Internally of the cabinet *a* and extending vertically upward from the sound pipe *f* I arrange the trumpet *b* which may be of any desired cross section and material, the upper edge of which is outwardly flared at one part *i* to the extreme upper edge of that side or back of the cabinet which is not furnished with an opening or sound aperture. The opposite side *j* of the trumpet *b* is correspondingly flared and joined to the lower edge of the front one of the aforesaid openings or that opposite the back or blank side of the cabinet. The two other sides *k*, *l*, of the trumpet *b* are similarly flared and downwardly inclined in an oblique plane as shown in Fig. 2, from the higher to the lower sides above described, and it is also to be observed that the fretwork *h* is correspondingly inclined.

Over the top of the cabinet *a*, and to prevent the ingress of dirt and dust to the trumpet, I may arrange a thin perforated cover of silk gauze or other light material which does not interfere with the sound reproduction. Above this gauze covering, and at a short distance therefrom, but, preferably, of less area, I mount or support a thin sheet of wood, metal or analogous material *m* which constitutes a sound diffuser and tends to deflect the reproductions effectively in all directions. In the drawing this diffuser *m* is hinged at *n* to an upstanding part of the back of the cabinet *a* and it is supported in the front by pegs or posts *o*, *o*; and I wish to here point out that I am fully aware sound deflectors consisting of two

layers of wire gauze with an intervening layer of cotton wool have been applied to the sound gratings of instruments of the above type.

5 In some cases I may dispense with the openings and fretwork coverings *h*, *h*, and flare the trumpet all around to the upper edge of the cabinet, and inclose the spaces intervening between the sound diffuser *m*
10 and said upper edge by means of inclined strips of silk backed fret work, as indicated by the dot-and-dash lines *p*, *p*, in Fig. 1.

Obviously the upper edge of the trumpet *b* may be flared outwardly in various ways
15 to give a neat and artistic finish and I wish to point out that I do not restrict myself as regards its shape in plan, neither do I confine myself to a rectangular cross-section of the cabinet, or the particular contour of the
20 sound diffuser *m* shown and described.

From the foregoing it will be seen that by my invention I greatly improve the efficiency of gramophone, phonograph and the like cabinets, arranged in accordance there-
25 with and that without adding in the least degree to the difficulty of construction,

whereas I effect a considerable reduction in the cost of manufacture.

What I claim as my invention and desire to secure by Letters Patent is:— 30

A gramophone or phonograph cabinet comprising a casing, an instrument and a trumpet therefor in the casing, the trumpet being arranged in a vertical position with its mouth in an inclined plane, fret-work 35 forming the upper portion of the casing from the inclined plane of the mouth to a horizontal plane from the high point of the mouth of the trumpet, a covering of silk arranged above the end of and falling down 40 below the fret-work to prevent ingress of dirt, and a hinged horizontal sound deflector of less width than the width of the casing arranged in contact with the top of said covering, substantially as described. 45

In witness whereof I have hereunto set my hand in the presence of two witnesses.

JOSEPHINE MORTON.

Witnesses:

EDWARD LAURENCE HEYWOOD ELLIOTT,
JOHN OSWALD FARRER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

992, 196

J. R. CRAIG, JR.
GRAMOPHONE RECORD AND HOLDER FOR THE SAME.
APPLICATION FILED MAY 28, 1910.

992,169.

Patented May 16, 1911.

Fig. 1.

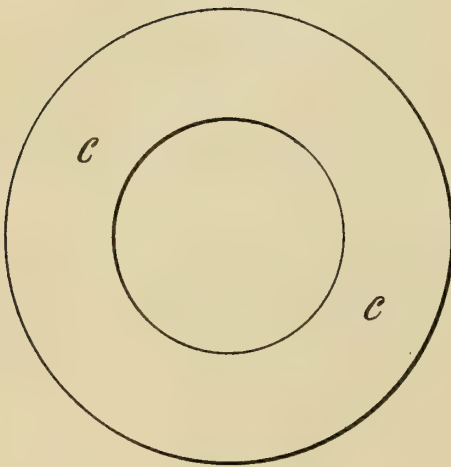


Fig. 4.

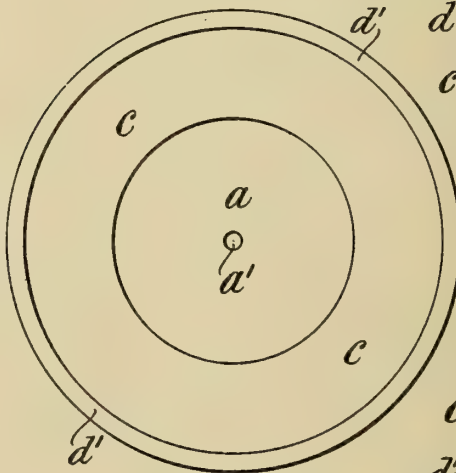


Fig. 5.



Fig. 2.

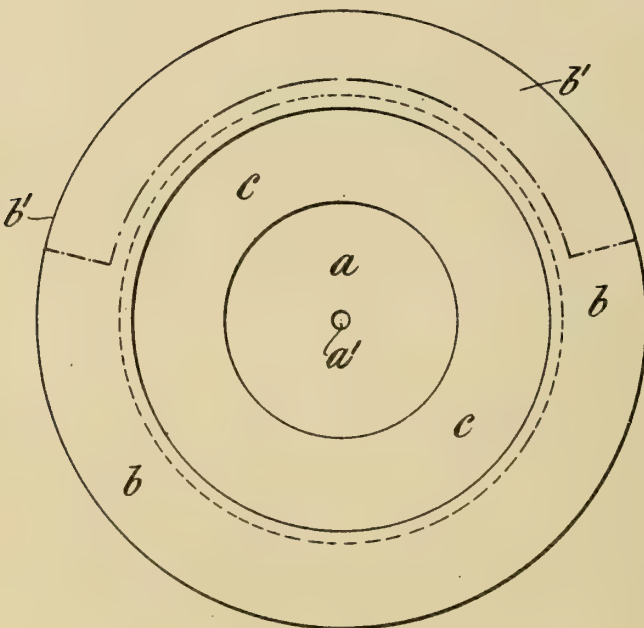
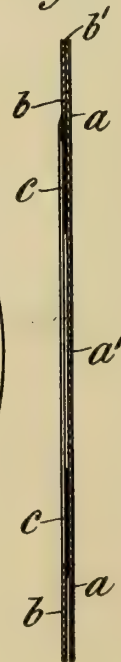


Fig. 3.



Witnesses.

E. B. Hazen
C. F. Early

Inventor
John R. Craig, Jr.
By his Attorneys
Baldwin & Wright

UNITED STATES PATENT OFFICE.

JOHN RICHARDSON CRAIG, JR., OF LONDON, ENGLAND, ASSIGNOR TO PHONOFILM SYNDICATE, OF LONDON, ENGLAND.

GRAMOPHONE-RECORD AND HOLDER FOR THE SAME.

992,169.

Specification of Letters Patent.

Patented May 16, 1911.

Application filed May 28, 1910. Serial No. 563,882.

To all whom it may concern:

Be it known that I, JOHN RICHARDSON CRAIG, JR., a subject of the King of Great Britain, residing at Gloucester Mansions, Cambridge Circus, Charing Cross Road, London, England, have invented new and useful Improvements in Gramophone-Records and in Holders for the Same, of which the following is a specification.

It has before been proposed to use for gramophone records, disks of some light thin and flexible material, such disks when in use being rigidly clamped around their edges onto a rigid plane surface.

According to this invention an annulus is employed in place of a disk and this annulus is loosely held around its edge onto a more or less yielding backing.

Figure 1 is a plan of the record; Fig. 2 is a plan and Fig. 3 a section of the holder with the record in place; Fig. 4 is a plan and Fig. 5 is a section of a modified form of holder.

The holder consists of a disk *a* of cardboard preferably faced with blotting paper and having a hole *a'* at its center to receive the pin of the gramophone and having upon it a flat ring *b* of cardboard. The outer part *b'* of the width of about half of the circumference of this ring is cemented to the disk as indicated by dotted lines in Fig. 2 but the ring and disk are not otherwise fastened together so that the gramophone record *c* can be passed in and the whole circumference of its edge inserted and loosely held between them.

In the modified form of holder shown in

Figs. 4 and 5 the disk *a* (which as before forms the backing for the record *c* and is preferably faced with blotting paper) is inserted into an annular frame *d* of thin sheet metal provided with a flange *d'* which prevents the record *c* from escaping.

It is found that an annulus lies much flatter and is less liable to cockle than a disk and that the yielding holding and backing of it greatly diminishes the unpleasant metallic sound common in gramophones.

The material which it is preferred to employ for the record is celluloid and its thickness should be about that of stout paper its flexibility being such that while it is not materially deformed by its own weight it can nevertheless be bent by a very slight pressure.

What I claim is:—

1. A gramophone record, consisting solely of an annulus of thin flexible record-receiving material.

2. The combination of a thin flexible annular gramophone record and a holder for the record consisting of a backing and means for securing one edge of the record to holder.

3. The combination of a thin highly flexible annular gramophone record and a holder therefor, consisting of a yielding sound-absorbing substance and a ring applied to the outer edge of the holder engaging the outer edge of the record.

JOHN RICHARDSON CRAIG, JUNIOR.

Witnesses:

ALFRED NUTTING.

ROBERT T. WILLIAMS.

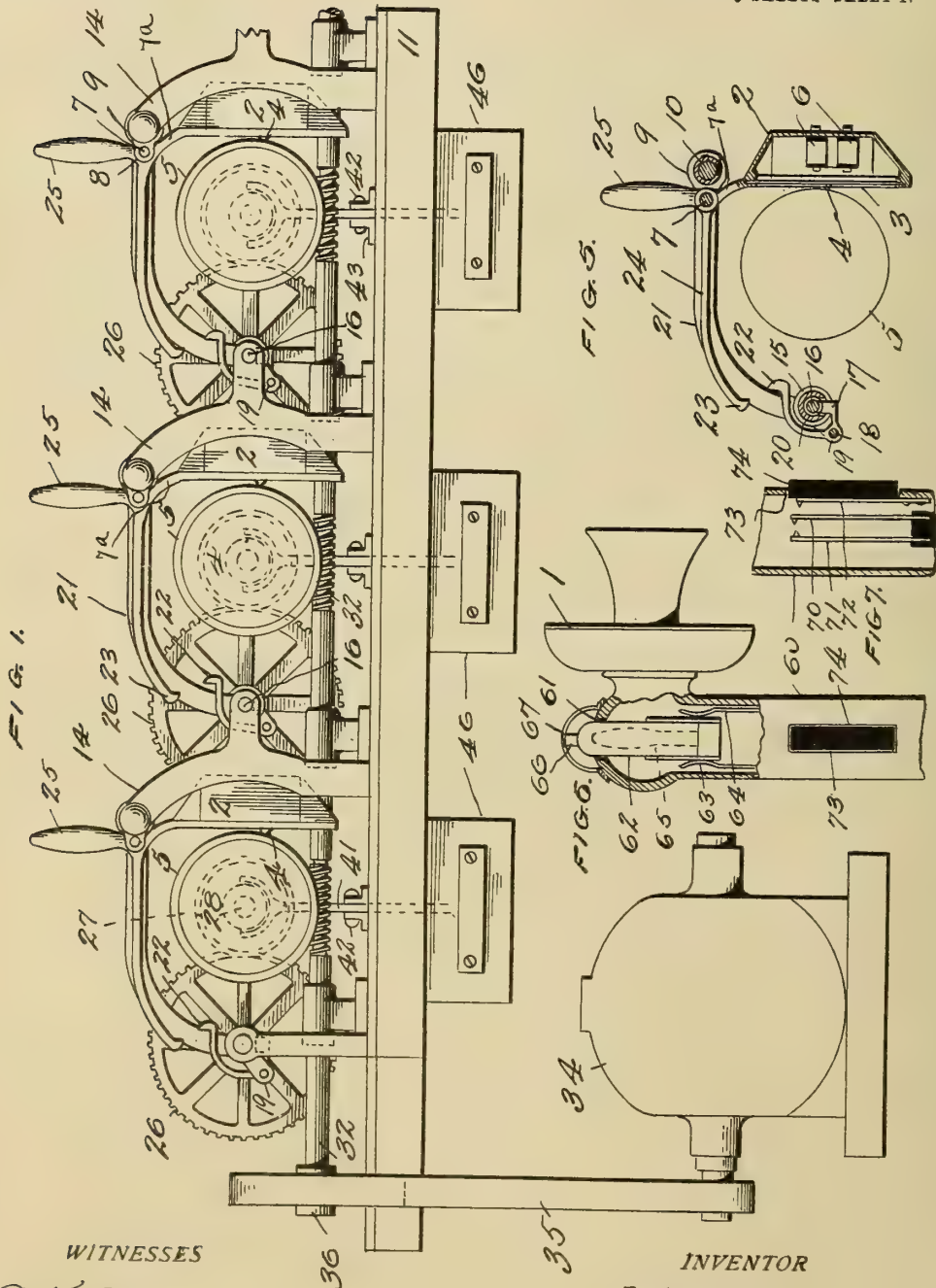
993.542

J. NOLL.
SOUND RECORDING APPARATUS.
APPLICATION FILED JAN. 31, 1910.

993,542.

Patented May 30, 1911.

3 SHEETS—SHEET 1.



WITNESSES
C. T. Davis
B. P. Fishburne

INVENTOR
John Noll

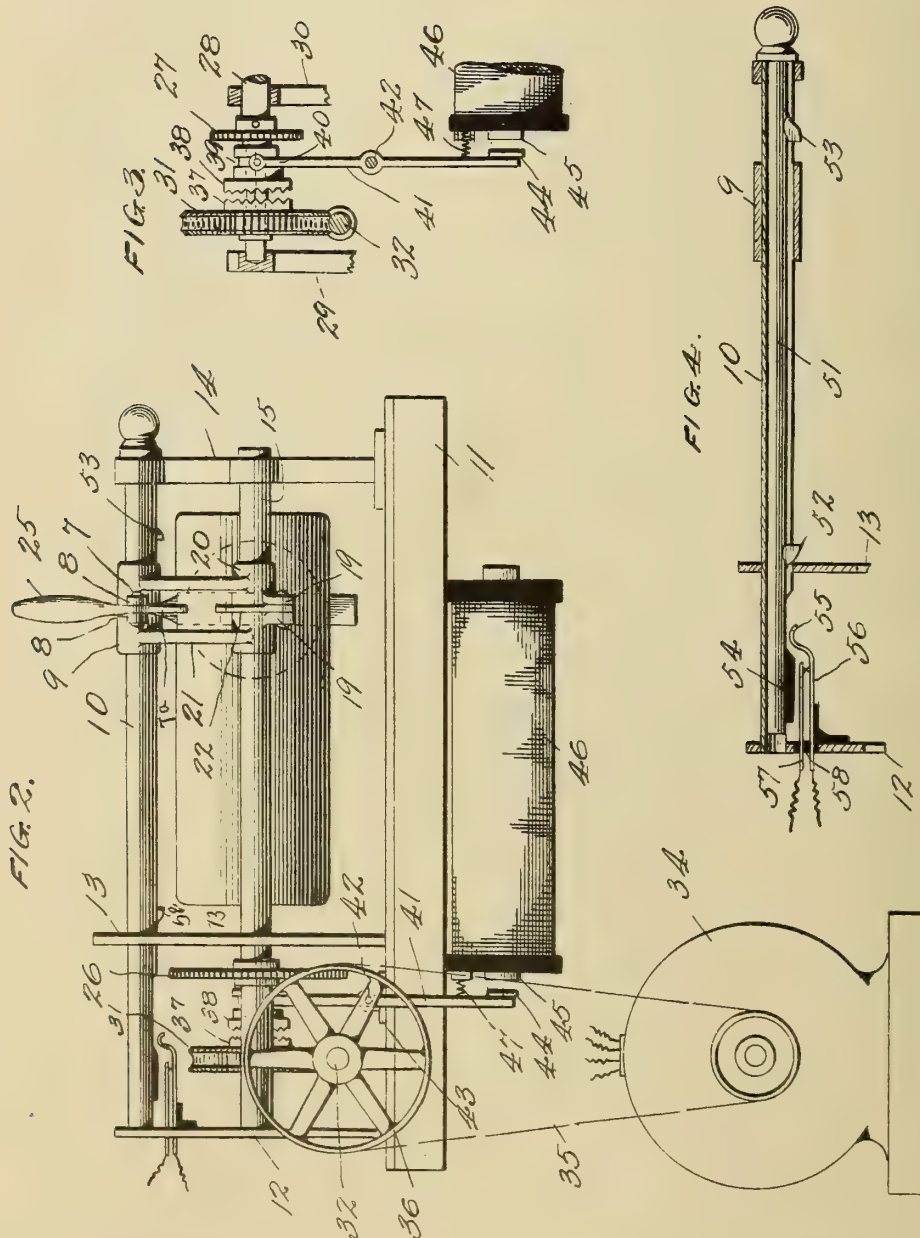
Attorney
By C. L. Parker.

J. NOLL.
SOUND RECORDING APPARATUS.
APPLICATION FILED JAN. 31, 1910.

993,542.

Patented May 30, 1911.

3 SHEETS—SHEET 2.



WITNESSES

C. K. Davis
B. P. Fushman

INVENTOR

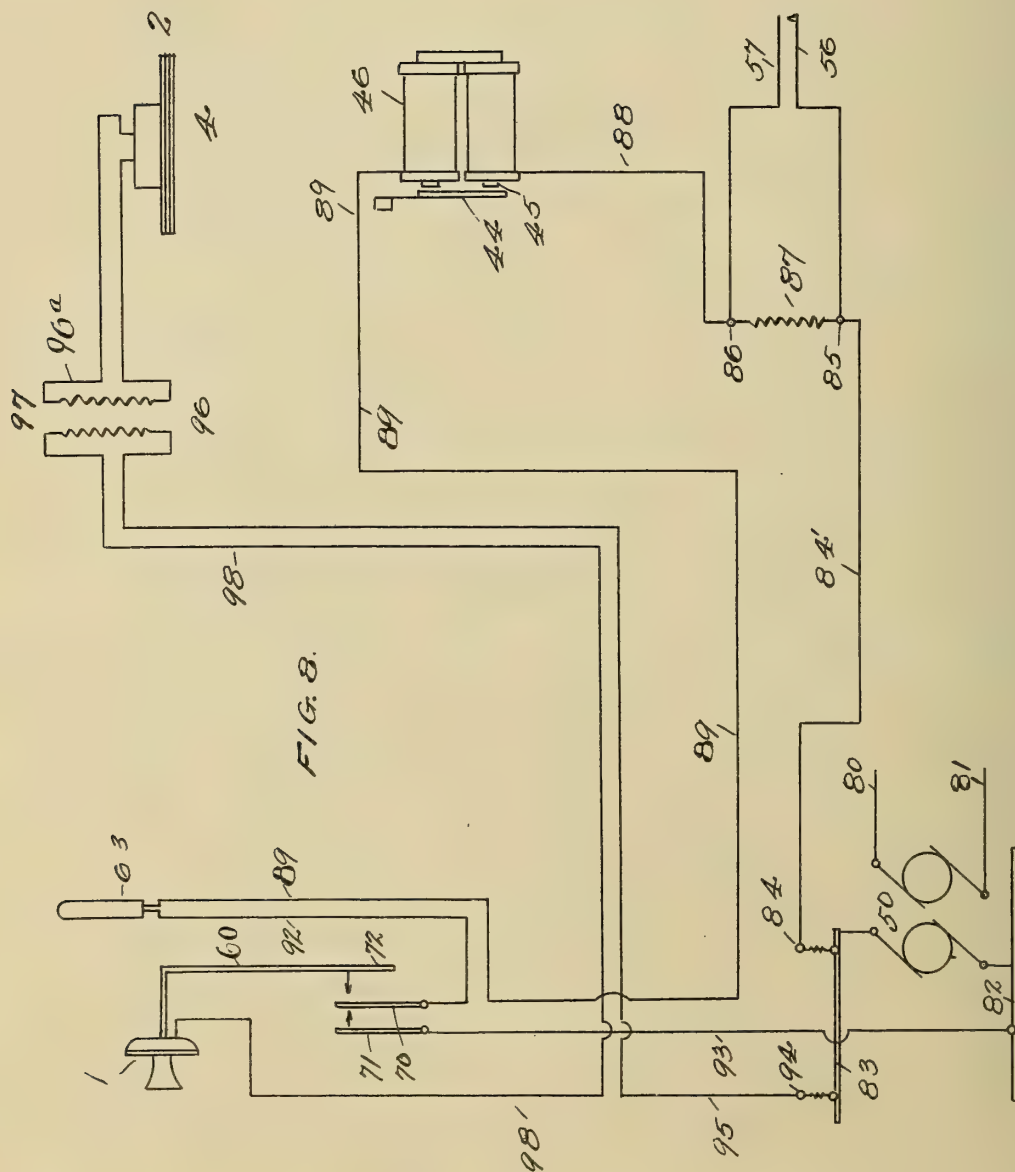
John Noll

Attorney

By C. L. Parkman.

993,542.

3 SHEETS—SHEET 3.



C. A. Davies
B. F. Furber

Attorney

By C. L. Parker.

UNITED STATES PATENT OFFICE.

JOHN NOLL, OF BROOKLYN, NEW YORK, ASSIGNOR OF ONE-HALF TO EUGENE DEL MAR,
OF NEW YORK, N. Y.

SOUND-RECORDING APPARATUS.

993,542.

Specification of Letters Patent. Patented May 30, 1911.

Application filed January 31, 1910. Serial No. 541,145.

To all whom it may concern:

Be it known that I, JOHN NOLL, citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Sound-Recording Apparatuses, of which the following is a specification.

This invention relates to sound recording apparatus, and contemplates the provision of novel means embodying a telephone and a phonograph for producing phonographic records of dictated matter in a more accurate, convenient and economical manner than has been heretofore possible.

Phonographs especially constructed for the purpose are extensively and successfully employed in offices and elsewhere for making records of dictated matter, which when reproduced, are written out by an operator. Such use of phonographs is subject to certain marked disadvantages. In the first place, the operator must provide a place usually near his desk for a cumbersome machine and for the cylinder, holders, and the like, and must provide electric current or other means of operating the mechanism of the phonograph. He must attend to the provision of blank cylinders, guard them with painstaking care against the readily occurring surface mutilation, both before and after use on the phonograph, and generally look after them until they are placed on the reproducing machine. Furthermore, the user must attend to the placing of the records in the machine; he must adjust the stylus in position for work, and generally give his personal attention and his time to the mechanical manipulation of the phonograph mechanism from the time he starts to dictate to it until the dictation is complete.

It is one of the important objects of this invention to overcome the above named disadvantages by wholly relieving the user of the burden of personally attending to operating the phonograph mechanism, supplying and removing records, adjusting the stylus, and looking after the wax cylinders from the time they are shaved, until adjusted in position on the reproducer.

Another important object of the invention is to provide convenient and reliable means for starting and stopping the rotation of the phonograph cylinder during dictation.

A further object of the invention is to

provide signal means to apprise the dictator when a cylinder is in position ready for use, and to notify him when the record on the machine to which he is dictating, is completed, and when such record is replaced by a fresh cylinder.

Other objects and advantages will appear in the course of the following description, wherein reference is made to the accompanying drawings, in which,

Figure 1 is a cross-sectional view showing several phonograph units and the driving means therefor. Fig. 2 is a side elevation of a single unit. Fig. 3 is a detail view of a coil operated clutch which I employ. Fig. 4 is a detail view of a slide rod for opening and closing the operative circuit. Fig. 5 is a detail sectional view showing the magnetic recorder and associated parts. Fig. 6 is a detail view partly in section, of the transmitter standard and a signal lamp mounted thereon. Fig. 7 is a detail sectional view of the transmitter standard showing the switch mechanism mounted therein, and Fig. 8 is a diagrammatic view of the electrical features of my invention.

My invention essentially comprises a telephone transmitter 1 and a receiver 2, both being of the usual construction, except that the diaphragm 3 of the receiver carries centrally thereof, a stylus 4 adapted for contact with the surface of a phonograph cylinder 5, as shown. The receiver 2, wherein are supported the magnets 6, is pivotally supported from a pin or bolt 7, by means of an arm 7^a extending between ears 8 mounted upon a sleeve 9, adapted for sliding movement along a supporting guide rod 10.

The receiver being freely pivoted on the pin or bolt 7, presses the stylus 4 against the cylinder 5, as will be evident from Fig. 1.

A table or other suitable support 11 is provided and suitably secured upon this are the standards 12, 13 and 14, these standards being disposed as clearly indicated in Figs. 1 and 2. These standards support the guide rod 10 and a hollow rod or sleeve 15, in which is mounted a shaft 16, which is screw-threaded for the greater portion of its length between the supporting standards 13 and 14.

The sleeve 15 is open at its lower side as indicated in Fig. 5 to permit the arm 17 to engage the shaft 16. The arm 17 is threaded at its free end for operative engagement with the screw thread on the

shaft 16 to effect the movement of the receiver stylus longitudinally of the cylinder, as will be more fully explained. The arm 17 is pivoted to a pin 18 passing through ears 19 supported by a sleeve 20, which is longitudinally movable upon the sleeve 15.

The sleeves 9 and 20 are bridged by the arms 21 and form therewith a suitable support for the receiver 2.

10 The arm 17 is continued beyond the point of its pivotal connection with the rod or pin 18 to form a latch 22, adapted for engagement with the free hooked end 23 of the arm 24 which is integral with the depending arm 7^a for supporting the receiver 2. 15 The handle 25 is likewise integral with the depending arm 7^a for supporting the receiver 2 and with the arm 24, and serves to move the receiver stylus into and out of engagement with the cylinder 5.

By reference to Fig. 5 of the drawing, it will be noted that when the handle 25 is manipulated to move the stylus 4 away from the cylinder 5 the hooked end 23 of the arm 24 will engage the latch 22 pressing the threaded end of the arm 17 out of engagement with the screw-threaded shaft 16 and also locking the receiver out of engagement with the cylinder 5.

30 The threaded shaft 16 is actuated by means of a spur gear 26 which engages a pinion 27 carried by the shaft 28 upon which is mounted the cylinder or form for receiving the phonograph cylinder. The shaft 28 is supported by a suitable bearing in the standards 29 and 30 (see Fig. 3). The shaft 28 receives its motion through the medium of a worm gear 31 in engagement with threaded portions of the worm shaft 32, 40 which shaft is continuously driven by a motor 34, connected by belt 35 with a pulley 36, mounted upon the shaft 28. The worm gear 31 is loosely mounted upon the shaft 28 and causes its rotation through the medium of a magnetic clutch comprising clutch elements 37 and 38, the former being secured to the worm gear 31, and the latter splined on the shaft 28. A slot 39 in the clutch element 38 is engaged by a yoke 40 carried 50 at the free end of an arm 41 pivotally mounted upon a pin or bolt 42 secured within bracket 43, mounted upon the support 1. The free end of the pivoted arm 41 terminates in an armature 44, disposed adjacent 55 to the core 45 of an electro-magnet 46 of sufficient strength to press the clutch element 38 against the tension of spring 47 into operative engagement with the clutch element 37. It will thus be seen that when the electro-magnet 46 is energized, shaft 28 will be rotated by reason of its engagement with the worm shaft 32 and shaft 16 will be rotated by reason of the engagement of gear 26 with pinion 27.

65 It may be here stated that the motor 34

constitutes a portion of the motor generator designated by the reference numeral 50, in Fig. 8 of the drawing. The motor which is supplied with any available current serves to operate the mechanism as hereinbefore 70 described, and also to operate the generator to produce a low tension current, preferably of about twenty-four volts, to be used in the telephone circuit and for operating the signal mechanism to be hereinafter described, and for energizing the electro-magnet 46. 75

By reference to Fig. 4, it will be noted that the guide rod 10 is hollow and contains a slide rod 51, having outstanding lugs 52 80 and 53 in position to be engaged by the sleeve 9 at the ends of its path of travel, and to slide the rod a short distance in the direction of movement of the sleeve 9. The slide rod 51 carries a block of insulating 85 material 54 in position to engage the curved end 55 of the contact spring 56 and press the same out of contact with contact spring 57, as will be evident in Fig. 4 of the drawing. The contact springs 56 and 57 are supported 90 by the upright 12 and insulated therefrom and from each other by the insulation 58.

It will be evident from Fig. 4 of the drawing, that when the sleeve 9 carrying the receiver 2 is moved to the right a distance sufficient to bring the stylus 4 nearly to the end 95 of the cylinder 5, the lug 53 will be engaged by said sleeve and the slide rod 51 moved to the right a distance sufficient to bring the block 54 against the spring 56 to press the 100 same out of engagement with the spring 57, thereby opening the circuit between the springs 56 and 57. The result accomplished by opening the circuit at this point will be hereinafter more fully explained. 105

By reference to Fig. 6, it will be seen that the standard 60 which carries the transmitter 1 is provided with an opening 61 at the top thereof through which extends a small incandescent signal lamp 62, supported in a socket comprising oppositely 110 disposed springs 63 and 64, through which a filament 65 of the lamp receives its current. The lamp is protected from injury by a skeleton guard comprising two metallic 115 strips 66 and 67 secured at their ends to the top of a transmitter standard.

Supported within the transmitter standard and suitably insulated therefrom and from each other, as shown in Fig. 7, are spring contacts 70 and 71, normally out of contact with each other. Disposed adjacent the contact spring 70 is a third contact spring 72, secured to the wall of the transmitter standard and in electrical contact therewith. Opposite the contact spring 72, is an opening 73 in the side of the transmitter standard, through which projects a block of suitable insulating material 74 secured to the spring 72 and movable there- 120 125 130 135 140 145 150 155 160

with. As shown in Fig. 7 of the drawing, the parts are so disposed that pressure against the block 74 will bring the spring 72 into engagement with the spring 70 and will force this spring into contact with the spring 71. The block 74 protrudes through the opening 73 for a distance such that when the transmitter standard is grasped in the hand of a user, the springs 70, 71 and 72 will be brought into contact conveniently and without conscious effort upon the part of the user.

The circuits by which the various electrical features of the present invention are connected will now be explained with reference to the diagrammatic view shown in Fig. 8. The motor generator 50 receives current from a suitable source of supply represented by the line wires 80 and 81 and the generator produces a low tension current preferably of about 24 volts. Metal strips 82 and 83 are connected to the opposite sides of the generator. From a binding post 84 in electrical communication with metal strips 83, a line 84' extends to binding post 85 between which and binding post 86 is interposed a suitable visual or other electrical signal 87 having a resistance of preferably about 100 ohms. The binding posts 85 and 86 are connected respectively with contact springs 56 and 57, as shown, so that when said springs are in contact, the current will pass from binding post 85 to 86 through such springs without traversing the signal 87. The binding post 86 is connected by line 88 with the electro-magnet 46, which magnet is energized only when the resistance of signal 87 is cut out of circuit by contact of springs 56 and 57. From electro-magnet 46 the line 89 leads to the lamp 63 in the head of the transmitter standard, the other side of the lamp being connected by line 92 with the contact spring 70 within the telephone standard. When the springs 70 and 71 are brought in contact by pressure upon the block 74, the circuit is completed through the springs 70, 71, the common return wire 93, to the metal strip 82.

From binding post 94, in communication with the metal strip 83, a line 95 leads to the primary circuit 96 of an induction coil 97 and from there by way of line 98 through the transmitter 1 and to the metal standard 60 with which the other side of the transmitter is connected. When the springs 70, 71 and 72 are in contact, the circuit is completed from the standard 60 through contacts 72, 70 and 71 back to metal strip 82 by the common return wire 93.

The secondary circuit 96' of induction coil 97 is connected as shown with the receiver 2, which actuates the stylus 4 as will be readily understood.

In the preferred form of my invention, the signal device 87 comprises a small visual

signal located near operator's desk. This signal shows only when the contact between springs 56 and 57 is broken, which by reduction of current, darkens signal lamp 63, and it will be understood from the foregoing description that the springs 56 and 57 are in contact, until the sleeve 9 comes into contact with lug 53 and moves the slide rod 51 sufficiently to bring the block 54 into engagement with the spring 56. This occurs only when the phonograph cylinder has been entirely utilized, and a new cylinder is required. It will thus be seen that when the glow disappears from lamp 63, it indicates to the dictator that he must suspend dictation until the operator at the phonograph end of the line removes the record and supplies a new cylinder. When this is done, the sleeve 9 is moved into contact with lug 52 and the slide rod 51 moved to the left so that spring 56 again contacts with spring 57, whereupon the glow appears in signal lamp 63, and the dictator knows that a new cylinder is ready for his use. When the visual signal 87 appears, the operator knows that a new cylinder is required.

In the description of my apparatus, I have referred to only a single unit, but it is obvious that any desired number of units may be provided in proximity to each other and operated from a common source of power, as clearly indicated in Fig. 1.

While I have specifically described the preferred form of my invention, it is to be understood that numerous changes may be made in the form, proportions, and minor details of the parts, and that my invention is not limited to the specific embodiment of my invention illustrated, except as defined in the appended claims.

Having described my invention, I claim:

1. In apparatus of the character described, a transmitter, a phonograph comprising a stylus, electro-magnetic means actuated by the transmitter current for operating said stylus, a rotatable support for a wax cylinder to be incised by said stylus, means adapted to be connected with said rotatable support, to effect the rotation thereof, a magnetic clutch adapted to connect said means with said rotatable support to effect the rotation thereof, a switch, a resistance, an electric signal in circuit with the magnet of said clutch, means to bridge said resistance to cut the same out of circuit, said electric signal being adapted to indicate when said resistance is cut out of circuit, and means to close the said switch, substantially as described.

2. In apparatus of the character described, a transmitter, a signal lamp associated therewith, a phonograph comprising an electrically operated stylus connected with said transmitter, a phonograph cylinder supported in proximity to said stylus,

a support for said stylus longitudinally movable with reference to said cylinder support, a slide rod actuated by the longitudinal movement of said stylus support, springs adapted to be thrown into and out of contact by the movement of said slide rod, said springs being in circuit with said signal lamp, a visual signal affording substantial resistance having its terminals electrically connected with said contact springs to carry the current from one side of the circuit connected with said springs, to the other when said springs are out of contact, and means arranged near the signal lamp for closing the said circuit, substantially as described.

3. In apparatus of the character described, a transmitter having a diaphragm, a receiver having a diaphragm, adapted to vibrate in correspondence with the transmitter diaphragm, a stylus actuated by the said receiver, a phonograph cylinder support in proximity to said stylus, a continuously rotating shaft, a coil actuated clutch to connect the rotatable cylinder support with said continuously rotating shaft to effect the rotation of the former means to effect the movement of the receiver longitudinally of the cylinder support, a circuit having contacts adapted to be opened by the said longitudinal movement of the receiver, a visual signal offering substantial resistance bridging said contacts and adapted to carry the current when said contacts are open, a signal lamp and the clutch-operating coil being included in said circuit, said signal lamp being adapted to glow when the said contacts are in engagement, and to remain dark when the said contacts are open, and means in proximity to said transmitter to control an electric current in said circuit, substantially as described.

4. In apparatus of the character described, a transmitter mounted upon a suitable standard, a signal lamp carried by the upper portion of said standard, an electrically actuated phonograph connected with said transmitter, and means to supply current to cause the said signal lamp to glow when the said phonograph is in operative position, substantially as described.

5. In apparatus of the character described, a transmitter, an electrically operated phonograph connected therewith, including a phonograph cylinder support adapted to be rotated, a continuously rotating shaft, a coil operated clutch adapted to connect the said cylinder support with the said continuously rotating shaft to effect

the rotation of the former, a hollow standard for supporting said transmitter, and a switch contained in said hollow standard having a portion extending outwardly therethrough, and adapted to be closed by pressure upon said outwardly extending portion to supply current to said clutch operating coil, substantially as described.

6. In apparatus of the character described, an electrically operated phonograph, comprising a receiver, a stylus operated thereby to incise a wax cylinder, said receiver being pivotally supported and provided with an arm having a hook at its free end, a rotatable screw-threaded shaft adapted to move the receiver longitudinally of the wax cylinder, a pivoted arm having a threaded end for engagement with said screw-threaded shaft, and a latch connected with said arm and adapted for engagement with said hooked end to move the threaded arm out of engagement with the screw-threaded shaft and to hold the said stylus out of engagement with the said cylinder, substantially as described.

7. In apparatus of the character described, a transmitter, a phonograph arranged at a distance from said transmitter and comprising a receiver adapted to actuate a stylus, a circuit between said transmitter and receiver comprising a suitable source of current, a clutch for stopping said phonograph when said receiver has moved a certain distance, an electro-magnet adapted when energized to hold said clutch in a position to cause the phonograph to operate, a circuit including said source of current connected to said electro-magnet, means for closing said circuits, an electric light arranged near said transmitter and in series with the circuit connected to said electro-magnet, a second light of greater resistance than said first named light connected in series with the last named circuit and near said receiver, normally closed contacts connected to said last named circuit in such a manner as to short circuit said second light, and means actuated by said receiver to open said contacts whereby the circuit is completed through said second light.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN NOLL.

Witnesses:

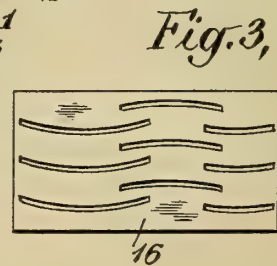
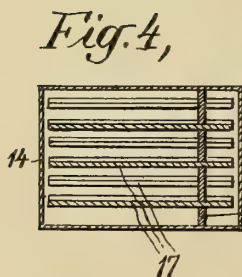
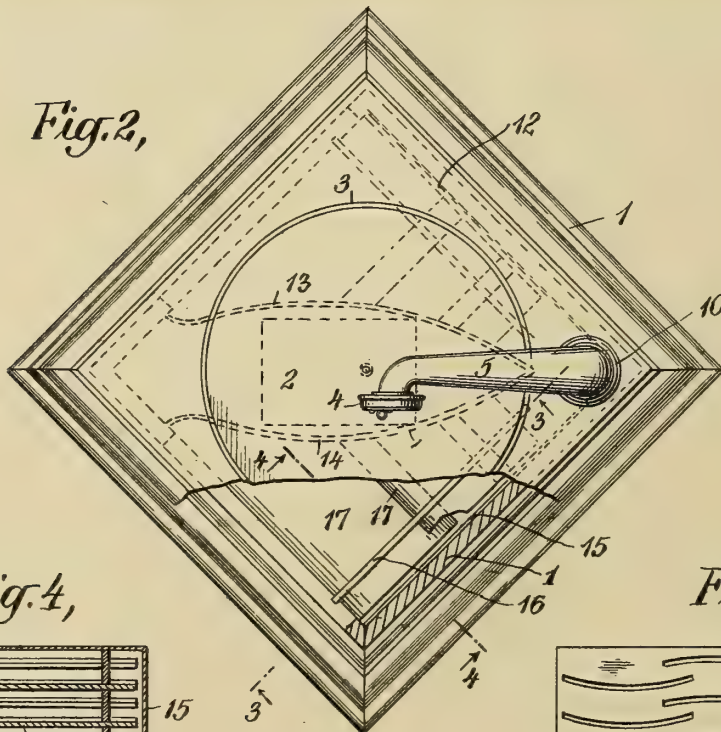
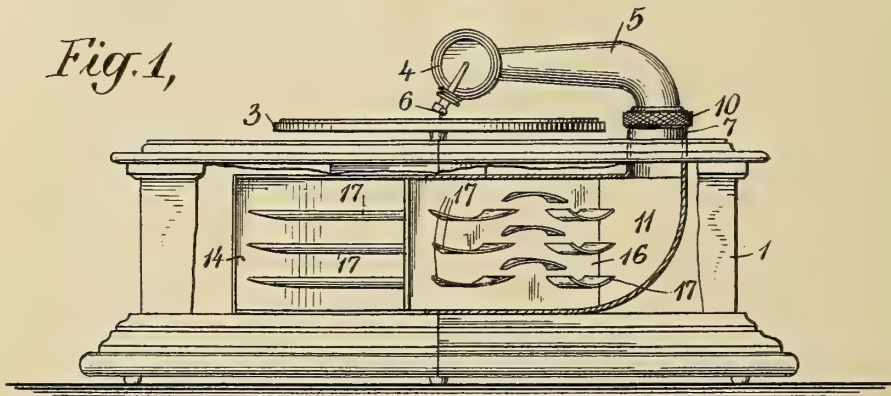
MARIE REIML,
EUGENE DELMAR.

993.793

J. A. RABBITT.
TALKING MACHINE.
APPLICATION FILED FEB. 8, 1910.

993,793.

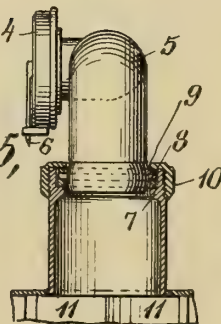
Patented May 30, 1911.



WITNESSES:

James A. Rabbitt
Henry Meyer

Fig. 5,



INVENTOR

James A. Rabbitt
BY *J. P. Edwards*
ATTORNEY

UNITED STATES PATENT OFFICE.

JAMES ALOYSIUS RABBITT, OF YOKOHAMA, JAPAN.

TALKING-MACHINE.

993,793.

Specification of Letters Patent.

Patented May 30, 1911.

Application filed February 8, 1910. Serial No. 542,711.

To all whom it may concern:

Be it known that I, JAMES A. RABBITT, a citizen of the United States, residing at Yokohama, in the Empire of Japan, have
5 invented certain new and useful Improvements in Talking-Machines, of which the following is a specification.

This invention relates to talking machines and has reference more particularly to the
10 construction of the sound-conveying and -amplifying devices for such machines.

The invention is directed to the provision of a talking machine of an improved construction, whereby a more compact structure and one which is of attractive appearance is provided, and such that an increased volume and a sweeter tone of the reproduced sounds are secured.

In accordance with the invention, the reproduced sounds are carried from the sound-box through a passageway which passes through the box or casing employed as a support and an inclosure for the motor; within the casing the sound-conveying
25 passageway is divided into two diverging parts which pass one on either side of the motor, thus forming a double resonance chamber. Each of these parts is of progressively increasing cross-sectional area, so
30 that the sounds are amplified while passing therethrough. In this way a tapering sound-conveyer is provided which is of sufficient size to effect a substantial amplification of the sound, the employment of a
35 bulky tapering horn extending above the machine is avoided, and ample space for the motor is provided without undue enlargement of the casing of the machine.

The invention further involves the provision of certain resonance devices in the sound-conveying passage which serve to augment the volume of the reproduced sounds and sweeten the tone, so that a more faithful reproduction of the recorded sounds is
45 obtained.

In the preferred embodiment of the invention, a support is employed mounted in the sound-conveying passage and carrying resonators which may be in the form of thin leaves, either metallic or non-metallic, increasing in width toward the end of the passage; the ends of these leaves or resonators are free of the walls of the passage and

they vibrate in harmony with the sound waves thereby amplifying and improving
55 the tone of the reproduced sounds.

I have illustrated the preferred embodiment of my invention in the accompanying drawings, in which—

Figure 1 is an elevation of a talking-machine, broken away and sectioned in part. Fig. 2 is a top view of the machine, Figs. 3 and 4 are detail views in section on lines 3—3 and 4—4 of Fig. 2, respectively, and Fig. 5 is a detail view of the mounting for
65 the tone-arm.

Referring to these drawings, 1 indicates the casing of the machine, this being of the usual boxlike form. Within the casing is the motor, indicated at 2, this being arranged in the usual or any suitable manner to drive a vertical shaft extending through the top of the casing and carrying a turntable 3 adapted to support a sound-record of disk form. The sound-box 4 is mounted
75 upon the free end of the tone-arm 5 with its stylus 6 adapted to track in the groove of the record on the turntable 3. The tone-arm 5 is mounted for both horizontal and vertical movement upon a tubular member 7 secured to and extending within the casing of the machine. The means for supporting the tone-arm thus is shown in detail in Fig. 5. The end of the tone-arm is pivotally connected by horizontally disposed pivot-pins
85 8 to a ring 9 which is adapted to move circumferentially between the top of the member 7 and a collar 10 threaded thereon.

Within the casing 1 of the machine, the member 7 is enlarged and is divided to
90 form two passageways as shown at 11, one at substantially a right angle to the other and both extending from the top to the bottom of the casing. Each of these two passageways of the member 7 is extended to
95 the side of the machine opposite it by walls 12, 13, 14 and 15 arranged vertically between the top and bottom of the casing 1, so that two passageways for the sound-waves are provided from the member 7
100 through the casing to the distant sides of the latter. The walls 12 and 15 are substantially parallel to two adjacent sides of the casing or those sides of the casing may be utilized to form the walls of
105 the sound passages; and the walls 13 and 14

diverge from the walls 12 and 15, respectively, so that the two sound passageways increase constantly in cross-sectional area to the ends thereof. Between the walls 13 and 14 is ample space for the motor 2. It will thus be seen that a double tapering sound-conveying passage of substantial length is provided so that the reproduced sounds will be considerably amplified, that this sound-conveyer extends through the casing of the machine, and that the taper of the conveyer is made sufficiently great without objectionably increasing the size of the casing and while leaving ample space for the motor.

In each of the branches of the sound-conveyer within the casing 1 is a support or resonance-board 16 extending lengthwise of the passage and disposed in a vertical plane. Each of these boards supports a plurality of deflecting vibrating resonators 17, preferably by having slots cut therein through which the resonators extend. The ends of the resonators extend in proximity to the walls of the passages but do not touch, as shown in Fig. 4, and the resonators are increased in width as the width of the passages increases. The resonators are preferably arranged as shown in Fig. 3, from which it will be seen that in each passage there are a number of sets of the resonators, those of each set being arranged one above another and slightly curved in the direction of the length of the passage, the curvature of each set being opposite to that of the adjacent sets.

When the reproduced sounds pass through the sound-conveyer, they cause the free ends of the resonators 17 to vibrate in harmony with them and in practice I have found that this affects both the volume and the quality of the reproduced sounds by increasing the volume and sweetening and clarifying the tone.

Having now described my invention, what I claim as new therein and desire to secure by Letters Patent is as follows:—

1. A talking-machine comprising a rectangular casing, a motor therein, a turntable above the top of the casing driven by the motor, a tone-arm pivotally mounted at one corner of the top of the casing, a sound-box carried by the tone-arm and adapted to coact with a record on the turntable, and a sound-conveyer leading from said tone-arm within the casing, said conveyer being divided within the casing to form two branches extending along the sides of the casing adjacent to the corner where the tone-arm is mounted and having their exits at the sides opposite, substantially as set forth.

2. A talking-machine comprising a motor, a turntable driven thereby, a sound-box adapted to coact with a record on said turntable, a sound-conveyer to which the sound-

box is connected, and a plurality of resonators supported intermediate their ends within the sound-conveyer and having their ends disconnected from the sound-conveyer so as to be free to vibrate in harmony with the sound-waves, substantially as set forth.

3. A talking-machine comprising a motor, a turntable driven thereby, a sound-box adapted to coact with a record on said turntable, a sound-conveyer to which the sound-box is connected, and a plurality of thin resonators mounted within the sound-conveyer, curved in the direction of the length of the sound conveyer and having their ends free to vibrate in harmony with the sound-waves, substantially as set forth.

4. A talking-machine comprising a motor, a turntable driven thereby, a sound-box adapted to coact with a record on said turntable, a tapering sound-conveyer to which the sound-box is connected, and a plurality of resonators mounted within the sound-conveyer increasing in width toward the large end of the conveyer and having their ends free to vibrate in harmony with the sound-waves, substantially as set forth.

5. A talking-machine comprising a motor, a turntable driven thereby, a sound-box adapted to coact with a record on said turntable, a sound-conveyer to which the sound-box is connected, and a plurality of sets of resonators mounted within the sound-conveyer and having their ends free to vibrate in harmony with the sound-waves, adjacent sets of said resonators being oppositely curved in the direction of the length of the conveyer, substantially as set forth.

6. A talking-machine comprising a motor, a turntable driven thereby, a sound-box adapted to coact with a record on said turntable, a tapering sound-conveyer to which the sound-box is connected, and a plurality of sets of resonators mounted within the sound-conveyer, having their ends free to vibrate in harmony with the sound-waves and increasing in width toward the end of the conveyer, adjacent sets of said resonators being oppositely curved in the direction of the length of the conveyer, substantially as set forth.

7. A talking-machine comprising a motor, a turntable driven thereby, a sound-box adapted to coact with a record on said turntable, a sound-conveyer to which the sound box is connected, a support within the sound-conveyer, and a plurality of thin resonators extending through openings in said support across the sound conveyer and having both ends thereof free to vibrate in harmony with the sound-waves, substantially as set forth.

8. A talking-machine comprising a motor, a turntable driven thereby, a sound-box adapted to coact with a record on said turntable, a tapering sound-conveyer to which

the sound-box is connected, a support within the sound-conveyer, and a plurality of sets of thin resonators extending through openings in said support, having both their
5 ends free to vibrate in harmony with the sound-waves and increasing in size toward the end of the sound-conveyer, adjacent sets of said resonators being oppositely curved

in the direction of the length of the conveyer, substantially as set forth.

10

This specification signed and witnessed this 22nd day of December, 1909.

JAMES ALOYSIUS RABBITT.

Witnesses:

J. K. CALDWELL,
GENJI KURIBARA.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

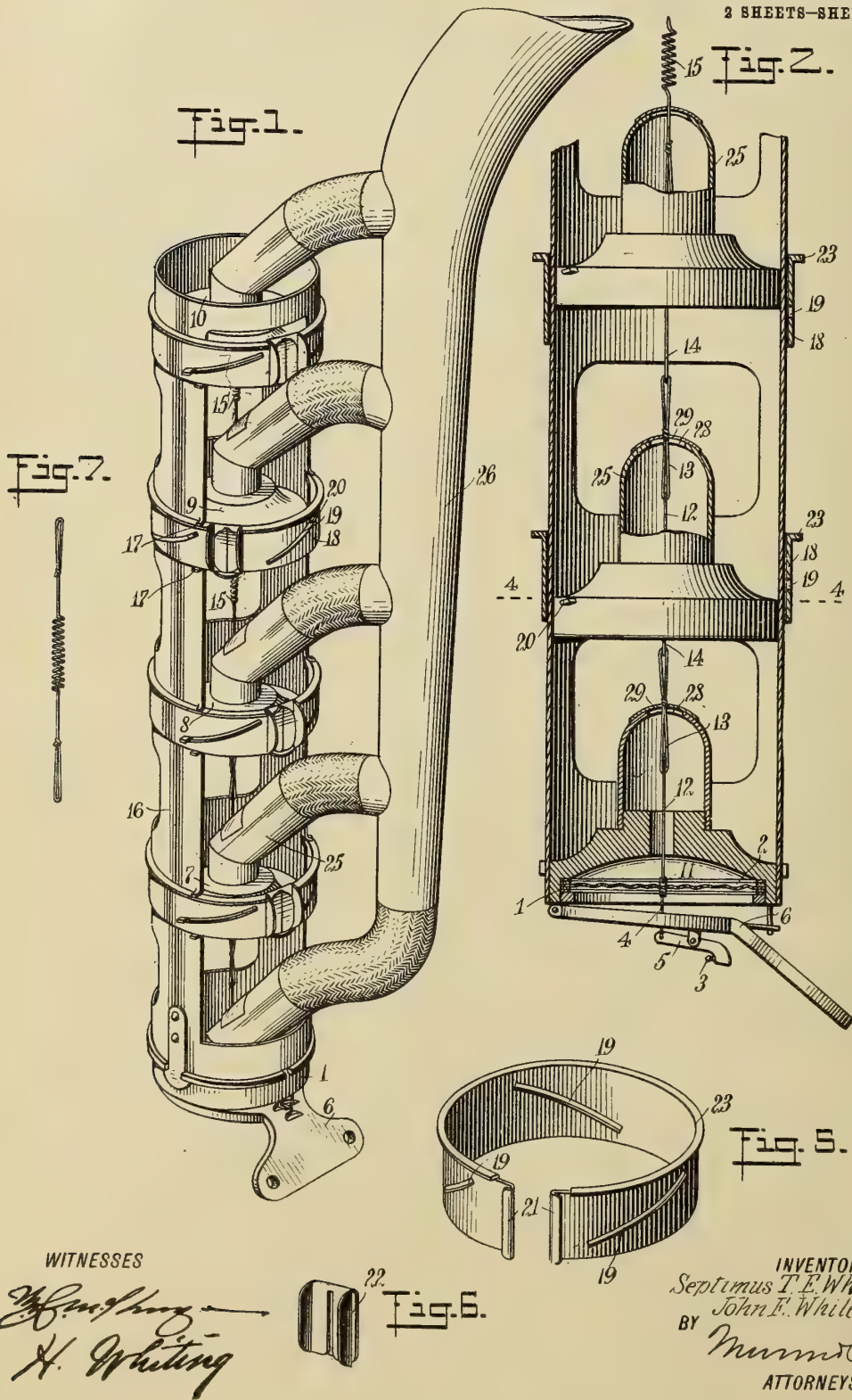


998, 931

993,931.

Patented May 30, 1911.

2 SHEETS—SHEET 1.



WITNESSES

Whiting
H. Whiting

Fig. 5.

INVENTORS
 Septimus T. E. White
 John F. White
 BY *Mumford Co.*
 ATTORNEYS



993,931.

Patented May 30, 1911.

2 SHEETS—SHEET 2.

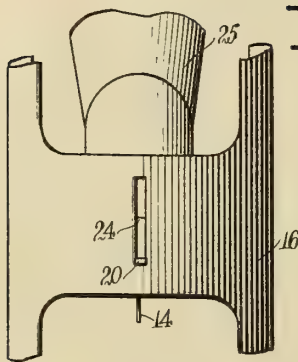


Fig. 3.

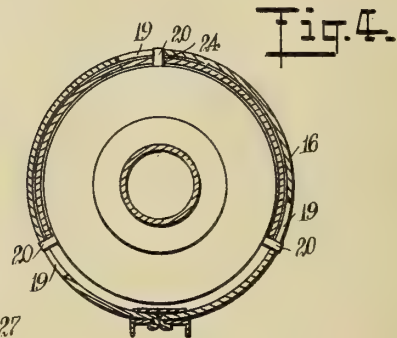


Fig. 4.

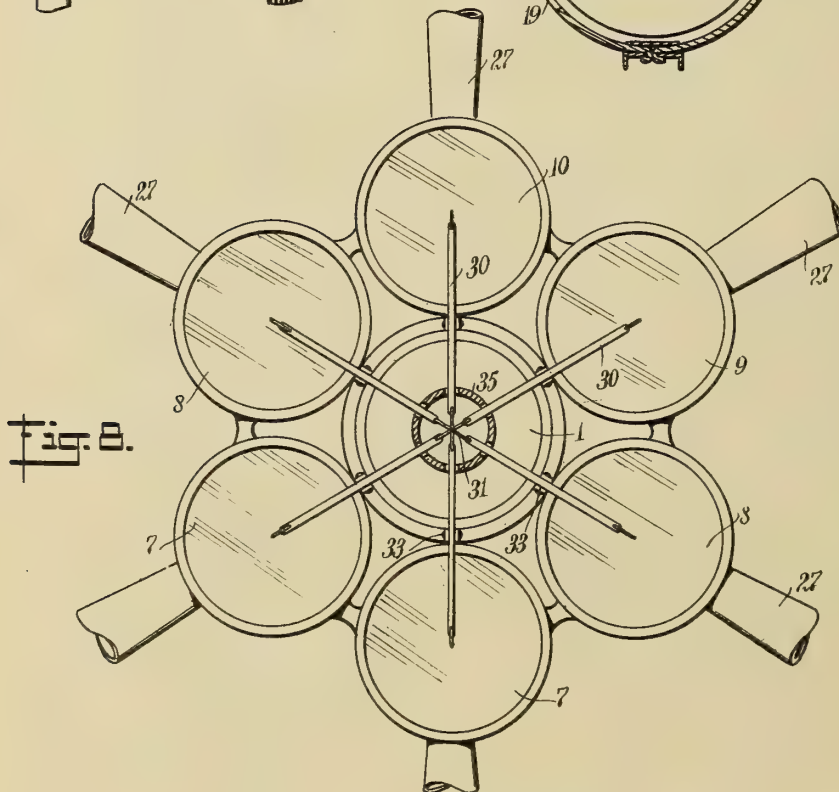


Fig. 5.

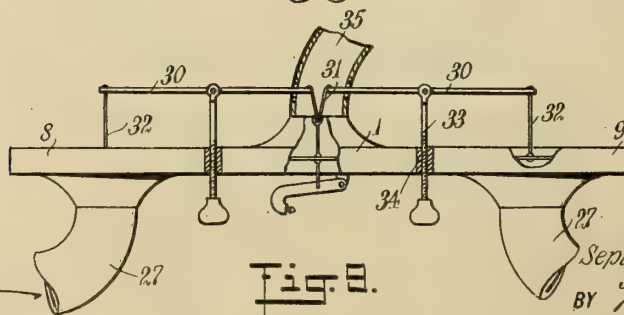


Fig. 6.

WITNESSES

Whiting
 A. Whiting

INVENTORS

Septimus T. E. White
 John E. White
 BY *Mumford*
 ATTORNEYS

UNITED STATES PATENT OFFICE.

SEPTIMUS T. E. WHITE, OF OKLAHOMA, OKLAHOMA, AND JOHN E. WHITE, OF NEW YORK, N. Y.

PHONOGRAPH.

993,931.

Specification of Letters Patent.

Patented May 30, 1911.

Application filed October 14, 1910. Serial No. 587,019.

To all whom it may concern:

Be it known that we, SEPTIMUS T. E. WHITE, a citizen of the United States, and a resident of Oklahoma city, in the county of Oklahoma and State of Oklahoma, and JOHN E. WHITE, a citizen of the United States, and a resident of the city of New York, borough of the Bronx, in the county and State of New York, have invented a new and Improved Phonograph, of which the following is a full, clear, and exact description.

This invention relates to an improvement in phonographs, whereby the effect of the vibrations imparted to the stylus by the disk or cylinder or any other type of recording tablet is modified by a plurality of diaphragms, thereby increasing the distinctness and volume of the sound.

An object of this invention is to provide an attachment for a phonograph in which a plurality of diaphragms are connected to a single stylus, whereby the effect of the movement of the stylus is amplified, with means for varying the number of diaphragms which will be operative at any time.

A further object of this invention is to provide an attachment for a phonograph which includes a plurality of sounding diaphragms or sounding boxes, connected either in series or multiple, with a primary sounding box or diaphragm.

These and further objects, together with the construction and combination of parts, will be more fully described hereinafter and particularly set forth in the claims.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views, and in which—

Figure 1 is a perspective view showing one form of our device, in which the sounding boxes are connected in series; Fig. 2 is a fragmentary vertical section of the form shown in Fig. 1; Fig. 3 is an enlarged detail fragmentary view of the frame with one of the rings removed to show the underlying structure; Fig. 4 is a horizontal section on the line 4—4 of Fig. 2; Fig. 5 is a perspective detail view of one of the adjusting rings. Fig. 6 is a detail perspective view of the lock for securing the ends of one of the adjusting rings together; Fig. 7 is an

enlarged view of one of the connections between a pair of juxtaposed diaphragms or sounding boxes; Fig. 8 is a fragmentary plan view of another form of our invention, in which the auxiliary sounding boxes are shown connected in multiple with the primary sounding box; and Fig. 9 is a fragmentary view in elevation, partly in section, of the form shown in Fig. 8.

Referring more particularly to the separate parts of the device, 1 indicates the main or primary sounding box, which is provided in either form of our invention. The sounding box is provided with a diaphragm 2 of any suitable structure, which is adapted to simulate the vibrations of a style 3 by being operatively connected thereto by means of a connecting member, such as a wire 4, and a style holder 5. The style may be held in engagement with a record tablet, such as a cylinder or disk, in any suitable manner, as by means of a pivoted weighted lever 6, which is commonly found in several makes of phonographs now on the market. As far as we are aware, the motion of the style has up to this time been transmitted to but a single sounding box and the diaphragm thereof. In our invention, we connect a plurality of other auxiliary sounding boxes 7, 8, 9 and 10 to the primary sounding box 1, in such a manner that the diaphragm 2 thereof will operate the diaphragm of the auxiliary sounding boxes, so as to cause them to vibrate and thus amplify and intensify the sound of the original sounding box. These sounding boxes may be connected in series, as illustrated in Figs. 1 to 4, or in multiple, as illustrated in Figs. 8 and 9. The advantage of the multiple system over the series system is that if a single intermediate sounding box, or the connections thereof, should become out of order, it would not disturb the action of the other sounding boxes. On each of the diaphragms, there are provided lugs 11, which extend from opposite sides of the diaphragms, and having openings therein, through which are inserted the connecting wires from the style 3 to the first diaphragm, and from the preceding diaphragm to the succeeding diaphragms. As will be seen by reference to Fig. 2, the connections are shown in the form of wires 12, 13 and 14, having interlocking loops formed in their

ends, so as to permit a relative movement of the wires, to bring the succeeding diaphragm or diaphragms into operative connection with the preceding diaphragm or diaphragms. In the case of the last few of the sounding boxes, for instance 9 and 10, these connections are provided with springs 15, which permit a slight relative adjustment of the sounding boxes after they have once been operatively connected together. This prevents the breakage of the connections in case some of the preceding connections are adjusted after the succeeding connections have been tightened up.

For the purpose of supporting the various sounding boxes in spaced relation, there is provided a frame 16, which may be of any suitable structure, and is provided with lugs 17 engaging the opposite sides of adjusting rings 18. There are preferably three of these lugs to each side of each ring, so as to form a tri-point support determining a plane. These rings are provided with cam or screw slots 19, in which extend projections 20 on the sounding boxes 7 to 10, in the form shown in Figs. 1 to 7. The rings 18 may be of any suitable structure, but a preferred form is illustrated in Figs. 5 and 6, which is shown as consisting of a band having the ends turned over, as at 21, to form locking joints with a clip 22, which is adapted to be inserted over the edges of the band and engage the turned-over ends 21, so as to secure the ends of the band together. The ring is also preferably provided with a circular flange 23, which permits it to be readily grasped and manipulated. The projections 20 on the sounding boxes pass through vertical slots 24 in the casing or frame 16, thereby preventing the sounding boxes from becoming out of register with each other when manipulated relative to each other, and to the frame 16. It will thus be seen that by rotating the adjusting rings 18, each sounding box can be operatively connected with the preceding sounding box by tightening the connection between them, so that the vibrations of the preceding diaphragm will be transmitted to the succeeding diaphragm.

In case all of the connections are tight, every diaphragm will vibrate when the style 3 vibrates. The sounding boxes may be connected in series by suitable outlet conduits 25, to a common horn 26, as illustrated in Fig. 1, or they may be connected to separate and distinct horns 27, as illustrated in the form shown in Figs. 8 and 9. By reason of the construction of the form shown in Figs. 1 to 7, the wire connections must pass through openings 28 in the outlet conduits 25. These openings are closed as much as possible by means of flexible coverings 29, which may be of any suitable material, such as adhesive tape, rubber or the like, so as to keep the sound in the conduits. In the form

shown in Figs. 8 and 9, the vibrations of the main or primary sounding box 1 are transmitted from this diaphragm to the diaphragms of the auxiliary sounding boxes grouped around it, by means of individual transmitting connections. These connections may be of any suitable form, and are shown as comprising levers 30 pivoted intermediate their ends and connected by flexible wires 31 and 32, respectively, to the diaphragms of the main and the auxiliary sounding boxes. In order that any one or all of these auxiliary sounding boxes may be thrown into or out of operative connection with the main sounding box, the pivotal supports for the levers 30 are shown adjustable, and in this case, are illustrated as being formed of rods 33, adjustably connected by screw-threaded connection with a frame 34 in the form of an annular ring. In this latter form, the main sounding box may or may not be provided with an outlet conduit 35, which may be connected in series, with the other conduits, to a common horn, or to a separate individual horn.

The operation of the device will be readily understood when taken in connection with the above description. In either form, the machine is so located on the frame of the phonograph that the style 3 will engage the cylinder, disk, or other form of record tablet, and thus produce either a record on the record tablet or reproduce a song, speech, or other collection of sounds by vibrations of the diaphragm of the primary or main sounding box 1. In the form shown in Figs. 1 to 8, any number of the successive sounding boxes may be operatively connected successively to the main sounding box 1 so as to have their diaphragms vibrated simultaneously with the vibrations of the main diaphragm. A simple turn of any one of the rings 18 disconnects or connects the succeeding sounding box or boxes with the preceding sounding box or boxes. If any one of the preceding boxes are disconnected, those following will naturally also be operatively disconnected from the style 3. In the form shown in Figs. 8 and 9, where the sounding boxes are shown arranged in multiple, any or all of the auxiliary sounding boxes can be operatively connected to the main sounding box by simply adjusting their pivoted screws 33. It will thus be seen that the vibrations produced in the main sounding box can be modified and intensified by adding to the effect of the main sounding box the effect of one or more auxiliary sounding boxes.

While we have shown two embodiments of our invention, we do not wish to be limited to the specific details thereof, but desire to be protected in various changes, modifications and alterations which may come within the scope of the appended claims.

Having thus described our invention, we

claim as new and desire to secure by Letters Patent:—

1. The combination with a main sounding box, of means adapted to engage a record tablet to transmit sound impulses between said record tablet and said main sounding box, one or more auxiliary sounding boxes adapted to have the vibrations of the one imparted to the other, connections between said main sounding box and said auxiliary sounding boxes for transmitting the vibrations of the one to the other, and means for throwing said connections into and out of active relation with said sounding boxes.

2. A phonograph attachment, comprising a plurality of sounding boxes operatively connected to a single style, the latter being adapted to transmit sound vibrations between said sounding boxes and a tablet, and means for operatively disconnecting one or more of said sounding boxes from said style.

3. A phonograph attachment, comprising a plurality of sounding boxes, connections between the diaphragms of said sounding boxes adapted to transmit the vibrations of one to the others, and means for controlling the connections between said diaphragms.

4. A phonograph attachment, comprising a single style, a plurality of sounding boxes operatively connected to said style, said style being adapted to transmit sound vibrations between a record tablet and said sounding boxes, and means for selectively disconnecting any number of said sounding boxes from said style.

5. The combination with a style, of a plurality of sounding boxes arranged in series, means for connecting each sounding box with the next adjoining sounding box, so that the vibrations of the one will be transmitted to the other, and individual means for varying the connection between said sounding boxes.

6. The combination with a style, of a series of sounding boxes, one of said sounding boxes being directly connected to said style, loose connections between said sounding boxes, and means for tightening said loose connections, whereby said sounding boxes may be operatively connected together, so that the vibrations of one will be transmitted to the others.

7. The combination with a style, of a series of sounding boxes, one of said sounding boxes being directly connected to said

style, loose connections between said sounding boxes, and means for tightening said loose connections, whereby said sounding boxes may be operatively connected together, so that the vibrations of one will be transmitted to the others, some of said connections having a spring located therein.

8. The combination with a style, of a sounding box having a diaphragm operatively connected to said style, a plurality of sounding boxes having their diaphragms loosely connected in series with said first-mentioned diaphragm, and individual means for varying the tension on the connection between said diaphragms, whereby one or more of said second-mentioned diaphragms can be operatively connected to said first-mentioned diaphragm for the purpose of reproducing the vibrations of said style.

9. The combination with a casing, of a series of sounding boxes arranged in spaced relation in said casing, rings rotatably mounted on said casing and having cam slots therein, lugs on said sounding boxes engaging said cam slots, whereby the rotation of said rings will vary the relative position of said sounding boxes, and means for operatively connecting said sounding boxes together, so that the vibrations of the one may be transmitted to one or more of the others.

10. The combination with a casing, of a series of sounding boxes arranged in spaced relation in said casing, rings rotatably mounted on said casing and having cam slots therein, lugs on said sounding boxes engaging said cam slots, whereby the rotation of said rings will vary the relative position of said sounding boxes, and loose connections between said sounding boxes, which may be tightened by the manipulation of said rings to operatively connect said sounding boxes together, so that the vibrations of one will be transmitted to the others.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

SEPTIMUS T. E. WHITE.

JOHN E. WHITE.

Witnesses for Septimus T. E. White:

A. L. WELSH,

J. M. OWEN.

Witnesses for John E. White:

HORATIO WHITING,

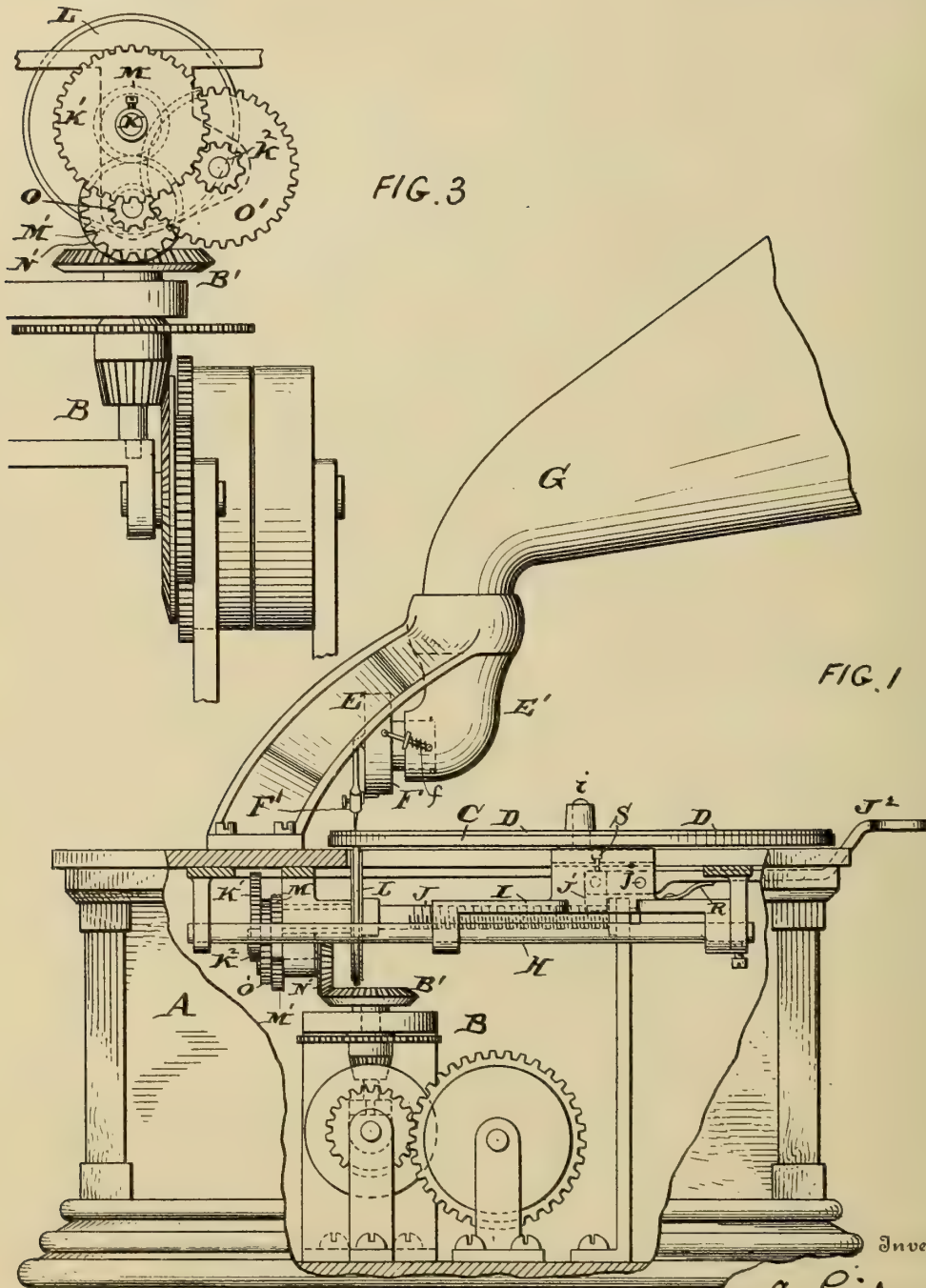
PHILIP D. ROLLHAUS.

R. L. GIBSON.
SOUND REPRODUCING MACHINE.
APPLICATION FILED DEC. 22, 1908.

993,980.

Patented May 30, 1911.

2 SHEETS—SHEET 1.



Witnesses

Dan'l Webster, Jr.
A. M. Kelly

By

Robert L. Gibson
[Signature]
Attorney



R. L. GIBSON.
SOUND REPRODUCING MACHINE.
APPLICATION FILED DEC. 22, 1906.

993,980.

Patented May 30, 1911.

2 SHEETS—SHEET 2.

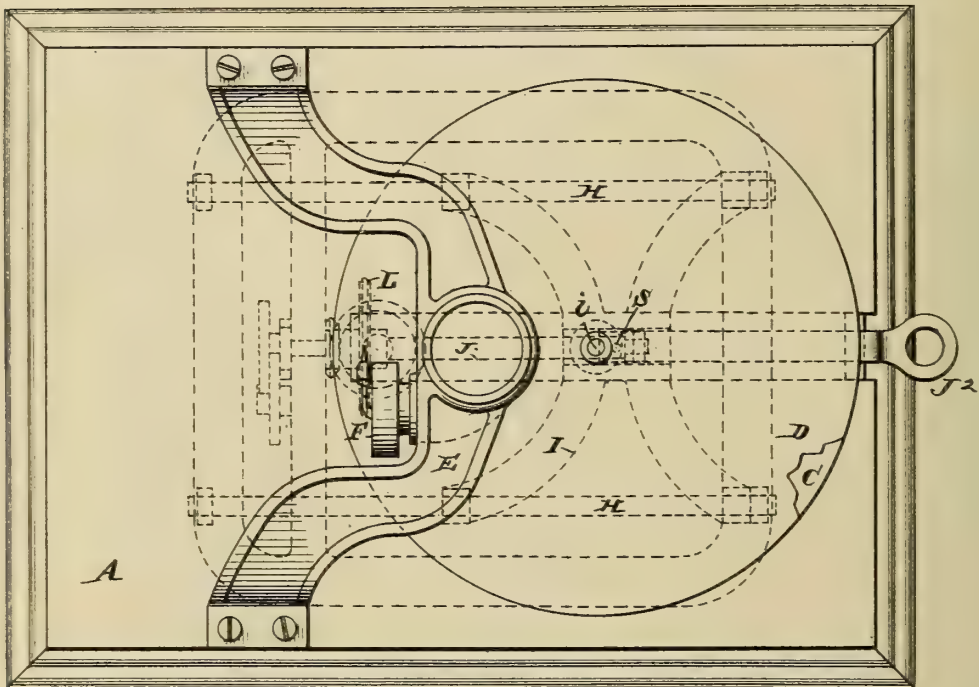


FIG. 2

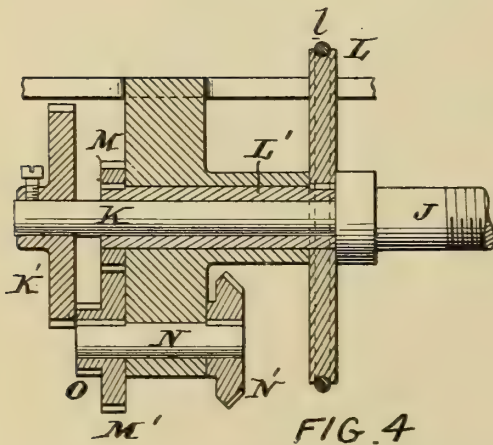


FIG. 4

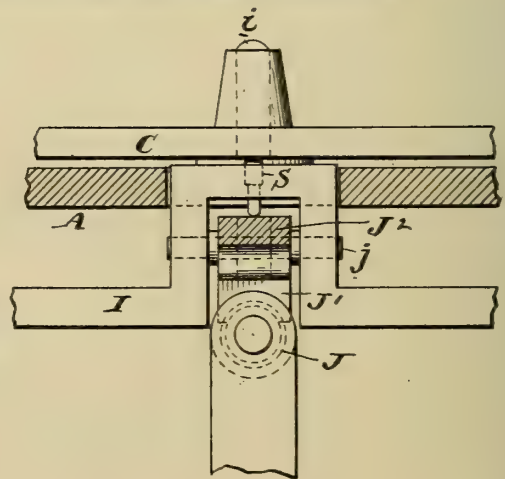


FIG. 5

Witnesses

Daniel Webster, Jr.
P. M. Kelly

By

Inventor
Robert L. Gibson

[Signature]
Attorney

UNITED STATES PATENT OFFICE.

ROBERT L. GIBSON, OF PHILADELPHIA, PENNSYLVANIA.

SOUND-REPRODUCING MACHINE.

993,980.

Specification of Letters Patent.

Patented May 30, 1911.

Application filed December 22, 1906. Serial No. 349,018.

To all whom it may concern:

Be it known that I, ROBERT L. GIBSON, of the city and county of Philadelphia, State of Pennsylvania, have invented an Improvement in Sound-Reproducing Machines, of which the following is a specification.

My invention has reference to sound reproducing machines and consists of certain improvements which are fully set forth in the following specification and shown in the accompanying drawings which form a part thereof:

The object of my invention is to provide a construction of machine which is adapted to employ a record tablet in disk form and which, in the operation of the record groove upon the stylus, will cause said record groove to travel in contact with said stylus at a uniform speed throughout the entire length of the groove.

My object is also to provide a construction of machine in which the sound box shall remain normally stationary while the record tablet is caused to travel under it to bring the different portions of the record groove in succession into operative position with respect to the stylus.

My invention consists of means for rotating a record table and simultaneously therewith shifting the axis of rotation relatively to a stylus of a sound box whereby successive portions of the record groove are brought into operative position with the stylus and whereby the sound box may be relatively stationary with respect to the record tablet.

My invention also consists of the combination of a rotating support for a record tablet combined with a sound box and stylus, and means for rotating the support of the record tablet with a gradually varying speed whereby the speed of travel of the record groove is substantially constant.

My invention also comprehends other features of construction in a sound reproducing machine, which, together with the features above specified, will be better understood by reference to the drawings, in which:

Figure 1 is a side elevation of a sound reproducing machine with a portion broken away to show the interior and embodying my improvements in its construction; Fig. 2 is a plan view of the same; Fig. 3 is an end view through a portion of the gearing and motor devices; Fig. 4 is a sectional elevation through a transmitting gearing and

driving mechanism for the record tablet support; and Fig. 5 is a sectional view of the detail for connecting and disconnecting the record tablet support with the transmitting gearing.

A is the case of the machine.

B is the power motor of the usual spring type.

C is the turn-table upon which the record tablet disk D is supported.

E is the bridging bracket carried upon the upper part of the case and having a horizontal tubular extension E'.

F is the sound box having its stylus F' resting in contact with the record tablet D, and G is the horn or amplifier carried upon a vertical tubular aperture of the bracket E.

The character of the record tablet adapted for use in connection with my improved machine is of a construction in which the record groove is so formed in different parts of the spiral that the speed of travel of the disk must be varied approximately in a continuous manner while the stylus travels from one end of the spiral groove to the other so that the surface speed of the groove under the stylus is substantially constant.

The turn table or support C is pivoted upon a pin *i* extending upwardly from a sliding carriage I which is guided horizontally upon the guide rods II II. A rotating feed screw J is arranged between the parallel guides II II and is driven by the spring motor B through gearing, to be later described.

J² is a lever which is pivoted at *j* to the carriage I and has its inner end hinged to a half nut J' which engages the threads of the screw J when forced down upon it under the action of the spring R operating upon the lever J². By depressing the free end of the lever J² the nut J' may be raised from the screw and, when in this position, the turn-table C and its carriage I may be shifted freely upon the guides II. This action is facilitated by raising the turn-table C from off the driving wheel L by the raising of the pin S which is carried by the frame I and is acted upon by the inner end of the lever J². Normally the turn-table C does not touch the pin S so that the said pin does not interfere with the free rotation of the turn table. The turn table is smooth upon its under side and normally rests upon the rotating driving wheel L, this wheel being driven by the spring motor in any unit

able manner. In the particular illustration shown, the wheel L is secured upon a sleeve L' journaled upon an extension K of the screw shaft J and is rotated by means of 5 gears M M', shaft N, beveled gears N' and B' connecting with the spring motor B. The screw shaft J is provided at its rear end with a spur gear K' which meshes with a pinion K² on the shaft N and by means of 10 which gears the feed screw shaft J is rotated with a much slower speed than the sleeve L' and its driving wheel L. Any other suitable construction of gearing or manner of driving the parts J and L may be employed, as will occur to anyone skilled in the art, the mechanism here shown being merely an example of devices which may be suitably employed. The driving wheel L may be provided on its periphery with rubber, as at l, if so desired.

The sound box F may be of any suitable construction and may have an adjustable rotation on a horizontal axis in the end of the tubular arm E' so as to be able to turn 25 the stylus up or down with respect to the record tablet, to permit the changing of the record tablets and also to bring the stylus into normal adjustment. A spring f may be employed for holding the stylus point in contact with the record tablet or elevated from the same according as to the adjustment of the sound box whether for playing or when changing the record tablets.

The operation of my improved machine 35 will now be understood: The machine being in the position shown in Fig. 1, and having just completed the reproducing of sound from a record tablet, the stylus of the sound box is turned upward by rotating the sound 40 box, the record tablet D is removed and a new record tablet is placed in position. The motor is then put into operation. The sound box is then rotated into position to bring the stylus into contact with the record 45 groove of the tablet. By the combined rotation of the feed screw J and the driving wheel L, the turn-table is rotated and at the same time its axis of rotation i is shifted longitudinally with respect to the sound box 50 and stylus so that the surface speed of travel of the record groove under the stylus remains substantially constant. This continues until the record tablet has been, together with the turn-table, shifted to bring 55 the end of the record groove under the stylus and which has completed the reproduction of the sound from the record groove of that particular tablet. The lever J² is then depressed and the carriage I and turn table 60 pulled again to position shown in Fig. 1 and a new record disk tablet substituted for that from which sound was before reproduced.

The result of reproducing sound from a record tablet in the manner herein referred 65 to, namely one in which the record groove is

so formed and the machine so operated that uniform or constant speed of travel of the record groove under the stylus is insured, results in a more perfect articulation or production of sound than where the surface 70 speed of travel of the record groove is constantly varying as in the case of the gramophone instruments as they are commercially constructed and operated. It will be seen, however, that an ordinary gramophone 75 record tablet would not be suitable for use in a machine of the character herein described because the speed of travel of the turn-table carrying the record disk is constantly changing and hence would cause the 80 gramophone record to travel at a rate of speed which would be inconsistent with that employed when producing the master record from which it was made; and consequently, the record tablets for my improved machine 85 must be specially made and adapted for a machine of this character only.

While the construction shown is excellently adapted for the purposes of my invention, I do not confine myself to the details, 90 as these may be considerably varied without departing from the principles of my invention.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a machine for reproducing sound, the combination of a rotating turn-table for the sound record tablet, a sliding frame in which the turn-table is journaled on a vertical axis and by which it may be shifted, mechanical feeding devices for feeding the sliding frame uniformly, power mechanism for directly rotating the turn-table independently of the feeding devices, means attached to the sliding frame for simultaneously disconnecting the turn-table from the feeding devices and from the power mechanism which rotates it and provided with an extension forming a handle by which the frame may be moved when freed from the feeding mechanism, a sound box, and a fixed support above the turn-table in which the sound box is journaled.

2. In a machine for reproducing sound, the combination of a rotating turn-table for the sound record tablet, a sliding frame in which the turn-table is journaled and by which its axis may be shifted, mechanical feeding devices for feeding the sliding frame uniformly, means extending beyond the turn-table for mechanically connecting the sliding frame with the feeding devices or disconnecting it therewith and directly moving the sliding frame independently of the feeding devices, a fixed frame arranged above the turn-table, and a sound box having a tubular part journaled in the fixed frame on an axis parallel to the turn-table but to one side of the plane of travel of the axis of 130

the turn-table and having the stylus point arranged to make contact with the record tablet upon the turn-table approximately in the vertical plane of the travel of the axis of the turn-table.

3. In a machine for reproducing sound, the combination of a turn-table for the record tablet, a sliding frame upon which the turn-table is journaled, a stationary bracket extending over the sliding frame and turn-table and provided with a tubular passage above the turn-table terminating at one end in an upright opening and at the other end in a horizontal opening, a sound box rotatably journaled in the horizontal opening of the bracket and with its diaphragm at right angles to the line of travel of the turn-table and sliding frame, and an amplifying horn supported from the vertical opening of the bracket.

4. In a machine for reproducing sound, the combination of a turn-table for the record tablet, a sliding frame upon which the turn-table is journaled, a stationary bracket extending over the sliding frame and turn-table and provided with a tubular passage terminating at one end in an upright opening and at the other end in a horizontal opening laterally disposed to a vertical plane through the central line of travel of the turn-table, a sound box journaled in the horizontal opening of the bracket and with its diaphragm at right angles to the line of travel of the axis of the turn-table and sliding frame, means for holding the sound box in an adjusted position with the stylus point in operative connection with the record on the turn-table and also out of such position when desired, and an amplifying horn supported from the vertical opening of the bracket.

5. In a machine for reproducing sound, the combination of a turn-table for the record tablet, a relatively stationary sound box and stylus, feeding means independent of the turn-table and its rotating means for slowly moving the axis of the turn-table toward the sound box, means for rotating the turn-table with a speed which gradually increases whereby the surface speed of travel of the record groove of the tablet under the stylus will be substantially constant, and means for connecting or disconnecting the turn-table with the means for rotating it and without removing the turn-table.

6. In a machine for reproducing sound, the combination of a turn-table for the record tablet, a relatively stationary sound box and stylus, means independent of the turn-table and its rotating means for slowly moving the axis of the turn-table toward the sound box, means for rotating the turn-table with a speed which gradually increases whereby the surface speed of travel of the record groove of the tablet under the stylus will be

substantially constant, and means for connecting or disconnecting the turn-table with the means for moving the axis of the turn-table toward the sound box.

7. In a machine for reproducing sound, the combination of a turn-table for the record tablet, a relatively stationary sound box and stylus, means independent of the turn-table and its rotating means for slowly feeding the axis of the turn-table toward the sound box, means for rotating the turn-table with a speed which gradually varies whereby the surface speed of travel of the record groove of the tablet under the stylus will be substantially constant, and means for simultaneously arresting the rotation of the turn-table and for disconnecting it from the feeding means and adjusting it relatively to the sound box.

8. In a machine for reproducing sound, the combination of a fixed frame having a tubular part provided with vertical and horizontal openings, a horn extending from the vertical opening of the tubular part, a turn-table arranged below the tubular part, means for rotating the turn-table and feeding it relatively to the tubular part, and a sound box loosely held so as to be rotatably supported by the horizontal opening of the tubular part on an axis parallel to the turn-table and said sound box having a stylus adapted for contact with a record tablet on the turn-table.

9. In a machine for reproducing sound, the combination of a frame having a tubular part provided with vertical and horizontal openings, a horn extending from the vertical opening of the tubular part, a turn-table arranged below the tubular part, means for rotating the turn-table and feeding it relatively to and from the tubular part, a sound box loosely held so as to be rotatably supported by the horizontal opening of the tubular part on an axis parallel to the turn-table and at right angles to the diaphragm and having a stylus adapted for yielding contact with a record tablet on the turn-table, and hand-operated devices extending beyond the turn-table for arresting the rotation of the turn-table and shifting it relatively to the sound box.

10. In a machine for reproducing sound, the combination of a frame having a tubular part provided with vertical and horizontal openings, a horn extending from the vertical opening of the tubular part, a turn-table arranged below the tubular part, means for rotating the turn-table and feeding it relatively to the tubular part, a sound box loosely held so as to be rotatably supported by the horizontal opening of the tubular part on an axis parallel to the turn-table and at right angles to the diaphragm and having a stylus adapted for yielding contact with a record tablet on the turn-table,

hand operated devices extending beyond the turn-table for arresting the rotation of the turn-table and shifting it relatively to the sound box, and a spring device for holding
5 the stylus of the sound box down to the record tablet on the turn-table or in an elevated position as desired.

11. In a machine for reproducing sound, the combination of a bracket having a tubular part directly over the turn-table formed with vertical and horizontal openings, a horn carried by the bracket and in connection with the vertical opening, a sound box carried by the bracket and connected with the
10 horizontal opening thereof, a rotating turn-table for the record tablet arranged below the tubular part of the bracket, and means for feeding the turn-table transversely to the sound box.
15

20 12. In a machine for reproducing sound,

the combination of a bracket having a tubular part directly over the turn-table formed with vertical and horizontal openings, a horn carried by the bracket and in connection with the vertical opening, a sound box carried by the bracket and connected with the horizontal opening thereof, a rotating turn-table for the record tablet arranged below the tubular part of the bracket, means for feeding the turn-table transversely to the sound box and uniformly toward the bracket and sound box, and hand device for moving the turn-table away from the said bracket and sound box. 25 30

In testimony of which invention, I here-
unto set my hand. 35

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

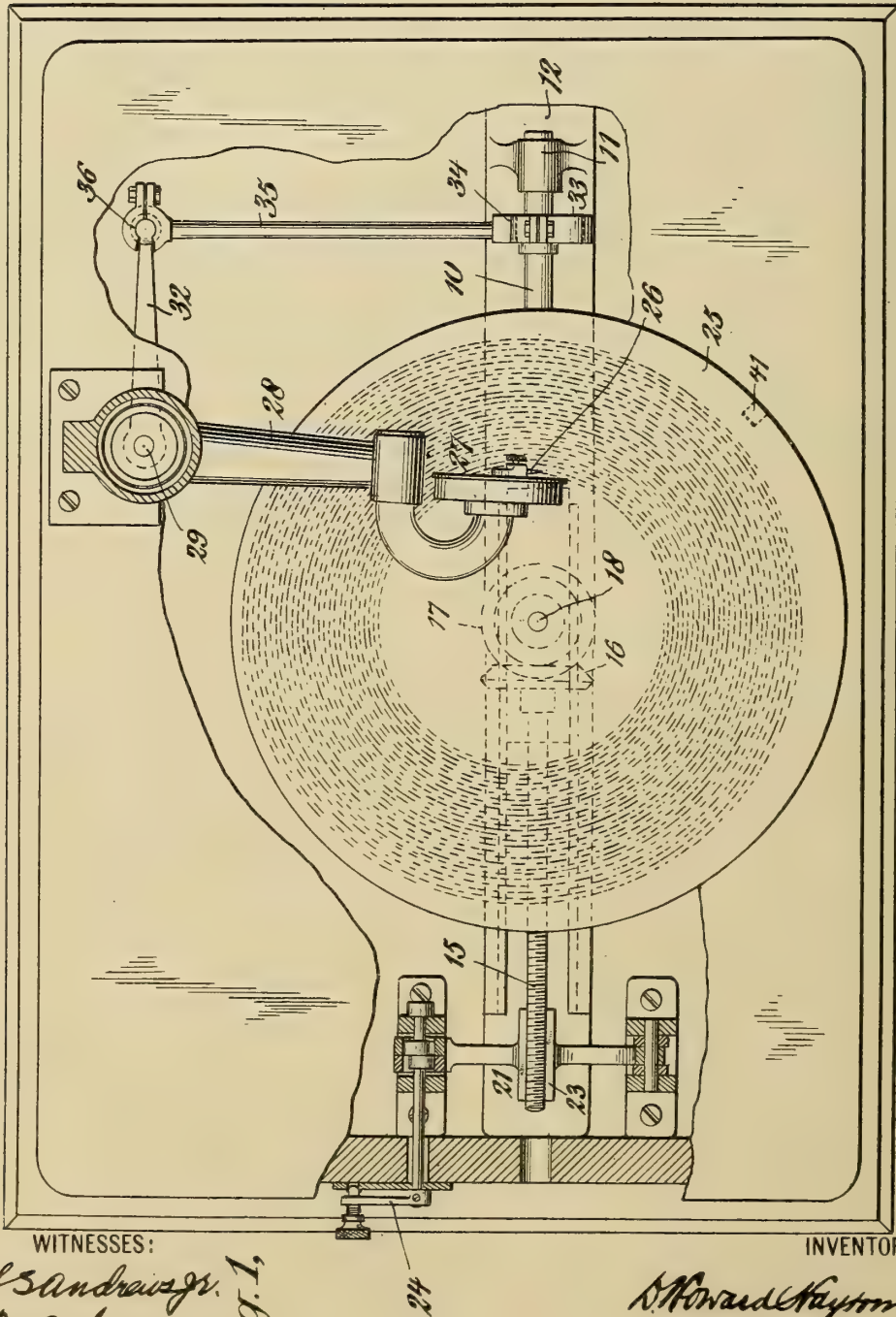
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D. H. HAYWOOD.
SOUND RECORDING AND REPRODUCING MACHINE.
APPLICATION FILED DEC. 24, 1909.

995,347.

Patented June 13, 1911.

4 SHEETS—SHEET 1.

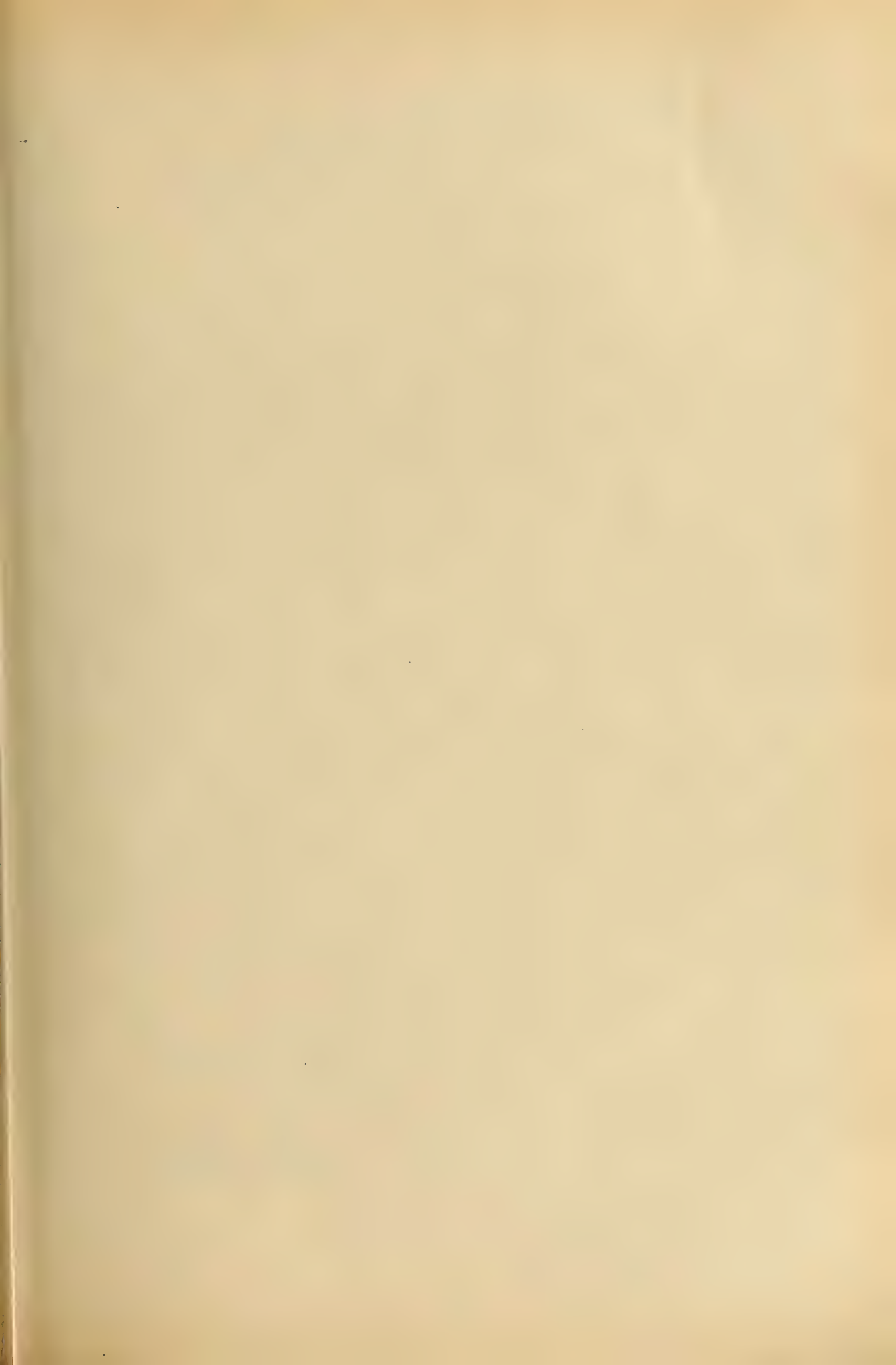


WITNESSES:

W. S. Andrews Jr.
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4 SHEETS—SHEET 2.

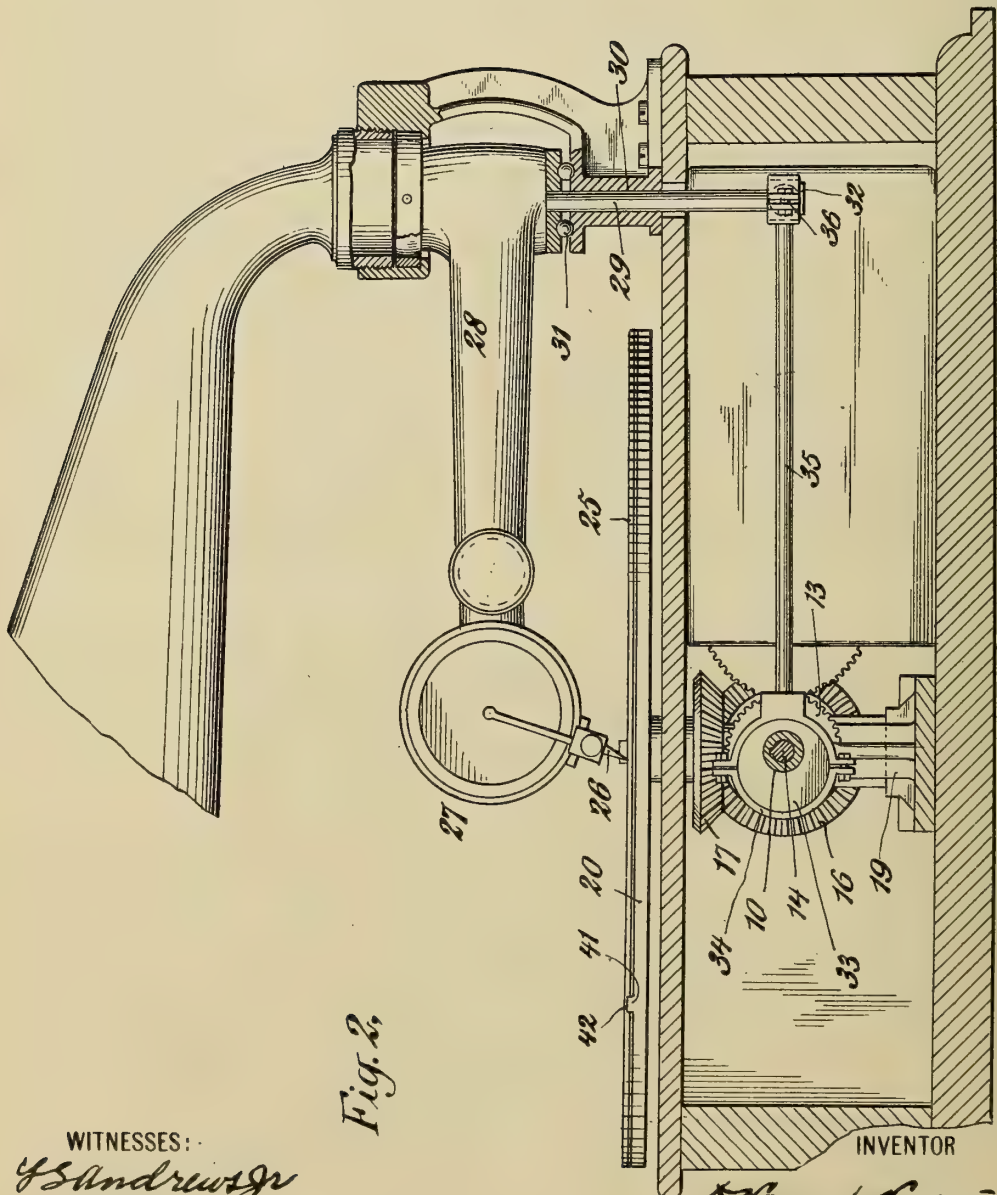


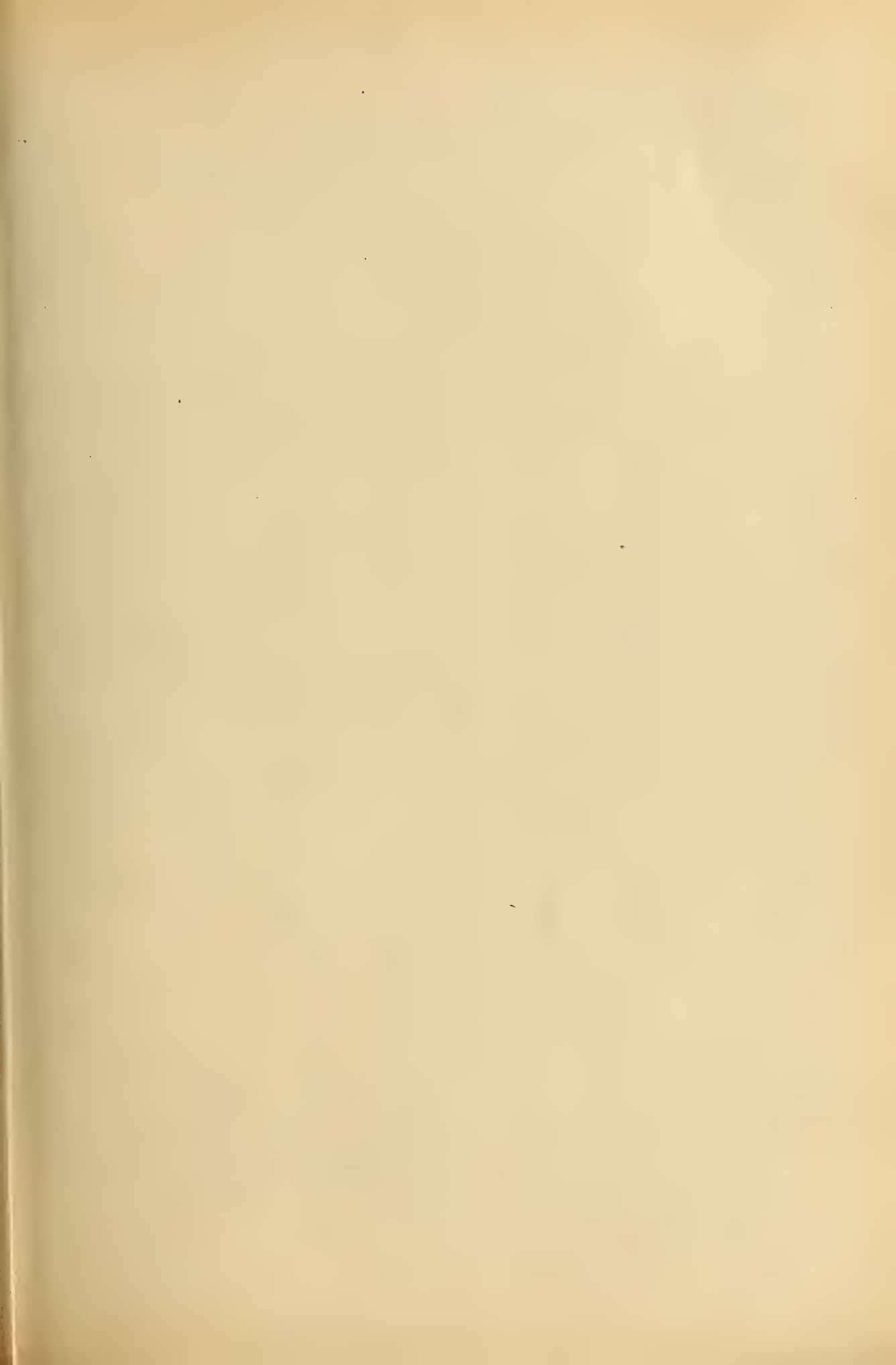
Fig. 2.

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4 SHEETS—SHEET 3.

Fig. 3.

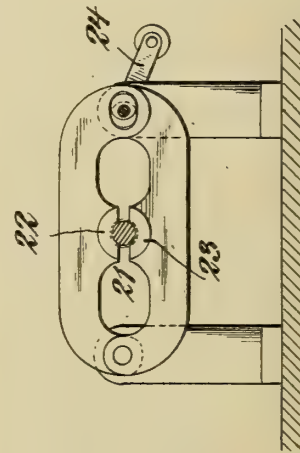
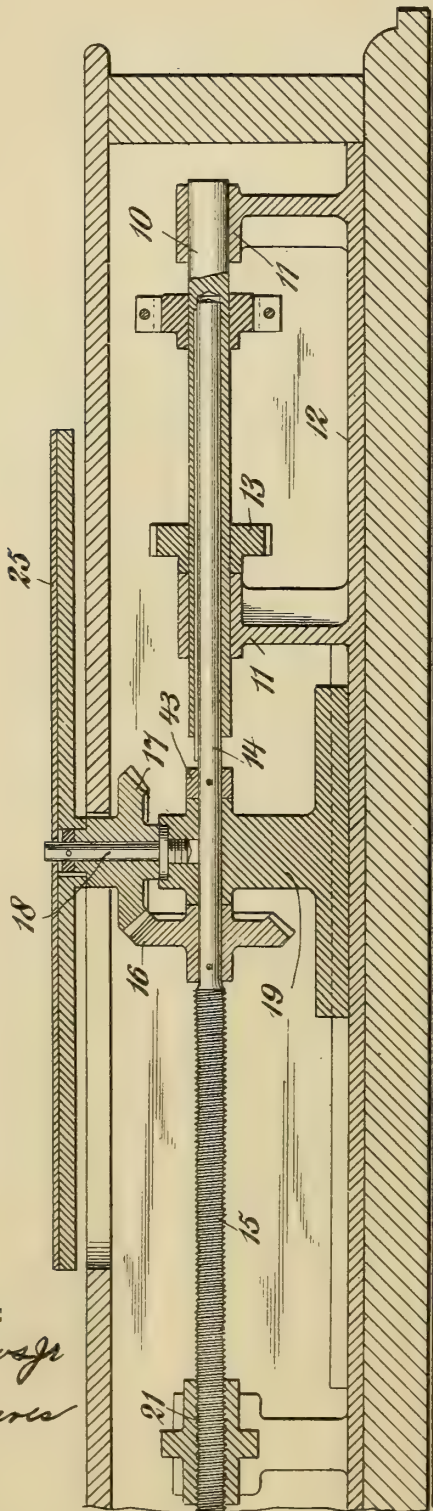


Fig. 4.

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4 SHEETS—SHEET 4.

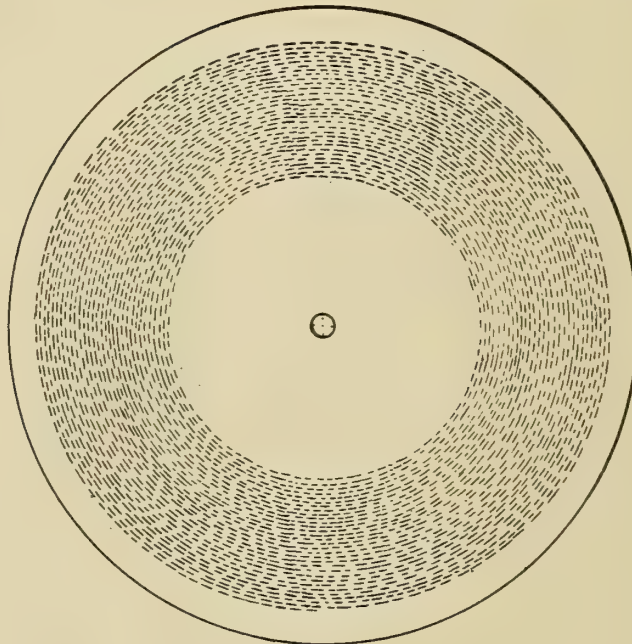


Fig. 6,

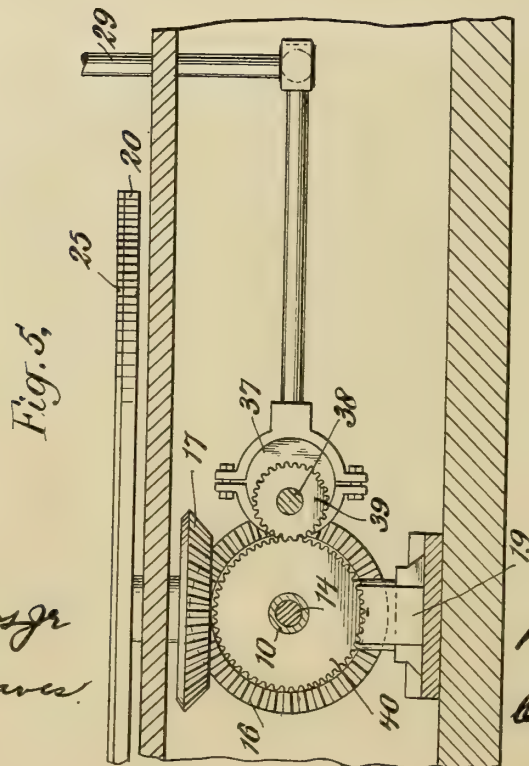


Fig. 5,

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UNITED STATES PATENT OFFICE.

DANIEL HOWARD HAYWOOD, OF NEW YORK, N. Y.

SOUND RECORDING AND REPRODUCING MACHINE.

995,347.

Specification of Letters Patent. Patented June 13, 1911.

Application filed December 24, 1909. Serial No. 534,834.

To all whom it may concern:

Be it known that I, DANIEL HOWARD HAYWOOD, a citizen of the United States of America, and a resident of New York, county and State of New York, have invented certain new and useful Improvements in Sound Recording and Reproducing Machines, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

In U. S. Letters Patent No. 948,137 which issued to me on the 1st day of February, 1910, a sound record is shown and claimed in which the sound groove, independent of its sound producing undulations, advances irregularly throughout its length, and my present invention relates to a machine for producing such a record and for reproducing sound from a record of such character. Sound producing records are commonly made by simultaneously rotating the record blank and producing a relative feeding movement between the record blank and a record stylus. In my present machine I provide, in addition to these two movements, for a third movement, namely, a relative lateral movement between the rotating sound record and the stylus independent of the feeding movement above referred to. It is, of course, apparent that in the broad aspect of my invention, the feeding may consist either of a lateral movement of the record blank while it is being simultaneously rotated, the stylus being meanwhile held stationary so far as such feeding movement is concerned, or a lateral movement of the stylus while the record is relatively stationary with respect to such lateral movement. Similarly the independent lateral movement may be given either to the stylus or to the record and that regardless of to which of these elements the feeding movements are imparted.

For the purpose of the present specification, I have described and illustrated a machine in which the feeding movements are imparted to the record simultaneously with movements of rotation thereof, while I have provided that the independent movements for causing the irregularity of the sound groove are imparted to the stylus, but it will be understood that the same is intended in no way as a limitation of my invention, but rather as an illustrative of one form of the machine embodying my invention. It will also be understood that while for clearness

of description I will refer to the machine mainly as a machine for producing the sound records, the machine may be similarly used with a reproducing stylus for reproducing the sound as will be well understood by those skilled in this art.

In order that my invention may be fully understood, I will now proceed to describe an embodiment thereof, having reference to the accompanying drawings illustrating the same, and will then point out the novel features in claims.

In the drawings: Figure 1 is a top view of a machine constructed in accordance with my invention, certain portions thereof being broken away to show other parts beneath them. Fig. 2 is a view in partial transverse section and partial side elevation thereof.

Fig. 3 is a view in longitudinal section through the record support and means for imparting rotational and feeding movements thereto. Fig. 4 is a detail transverse sectional view through one form of feed nut employed. Fig. 5 is a detail transverse sectional view showing a modified form of the mechanism for imparting the irregular movements to the stylus. Fig. 6 is a detail face view of a record which may be produced in the machine.

The machine comprises a drive shaft 10 mounted in suitable bearings 11 upon the main frame 12 of the machine, the said shaft being rotated by any suitable power element (not shown) suitably connected thereto as by means of a gear wheel 13. The said drive shaft is arranged in splined connection with the secondary shaft 14, one portion of which is screw-threaded as at 15 whereby the said shaft constitutes a feed shaft in addition to a shaft for transmitting rotary motion. Rotary motion is transmitted from the said shaft by means of miter gear wheels 16 and 17, the former being secured fast to the shaft 14 and the latter mounted loosely upon a stud 18 which is mounted upon a carriage 19. The said carriage is mounted in ways in the base plate 12 of the machine, and is arranged to slide longitudinally therein in a path parallel with the axes of the shafts 10 and 14.

Rotatively secured with the miter gear wheel 17 is a record carrier 20. From inspection of the drawings, it will readily be understood that rotary movements of the shaft 10 are imparted to the shaft 14 there-through, the miter gears 16 and 17 to the

record carrier 20. The threaded portion 15 of the shaft 14 is arranged in engagement with a feed nut 21 whereby as the said shaft 14 is rotated in one direction, *i. e.* clockwise, the said shaft will be gradually drawn to the left as viewed in Fig. 3, and as the carriage 19 is retained against relative longitudinal movement between the gear wheel 16 and a collar 43, the said carriage is thereby similarly moved, and with it the record carrier 20. The screw-threaded portion 15 has the proper pitch to give the desired feed so that the record will be simultaneously rotated and fed laterally in the operation of the machine. The feed nut 21 is conveniently formed in two portions, 22—23 (see Fig. 4) which are carried by arms adapted to be thrown in opposite directions by a suitably operating member 24, whereby the shaft may be released at the end of a feeding operation to permit the carriage 19 to be quickly returned to its initial position in which it is shown in Fig. 3 of the drawings. The record carrier 20 forms a support for a record blank 25, and a stylus 26 carried by a sound box 27 which is in turn carried by a tone arm 28, is arranged for engagement with the said record. The tone arm 28 is arranged to swing horizontally about a vertical axis so that it may have a lateral movement with respect to the record carrier. In the present instance, the said arm 28 is provided with a vertical shaft suitably mounted in a bearing 30 formed as a part of the frame of the machine, ball-bearings 31 being provided for the purpose of reducing the friction between the supporting means and the said arm so that the said arm will turn freely and with a minimum of effort. At its lower end the said shaft 29 is provided with an arm 32 by which it may be operated. The means here shown for operating the same comprises a cam 33 of the type commonly known as an eccentric, mounted upon the shaft 10, an eccentric strap 34 engaged thereby and an eccentric rod 35 connected with the said strap and having a ball and socket connection 36 with the said arm. A rotational movement of the shaft 10 will produce an oscillating movement of the arm 32 through the eccentric mechanism just described, which oscillating movement will be imparted to the tone arm 28, the same resulting in a lateral movement of reciprocation of the stylus 26 with respect to the record carrier. As this movement is produced simultaneously with the rotation of the record carrier and simultaneously with the feeding movement thereof, and a complete reciprocation synchronizes with a complete rotation of the record carrier, it will follow that the stylus will be caused to describe a spiral upon the record blank which is eccentric to the axis of rotation thereof,—and the groove resulting therefrom will in

its general direction, advance and recede transversely as the record is revolved.

Other forms of irregular groove may be produced by varying the movements imparted to the tone arm, and in Fig. 5 I have shown a cam or eccentric 37 carried by a shaft 38 connected by gearing 39—40 with the shaft 10, the gearing having such a ratio that the shaft 38 will revolve twice to one revolution of the shaft 10. Instead of producing a regular spiral which is eccentric to the center of rotation of the record carrier as in the form above described, such an arrangement will produce a form of groove which might be termed an "oblong spiral", this, of course, being for the reason that the stylus will have two reciprocating or oscillating movements for each revolution of the record carrier instead of one as in the first example shown. In Fig. 6, I have shown somewhat conventionally such a record. By using different forms or relationship of gearing, or cams or eccentrics of different character any desired form of groove may be produced as will be well understood. In case the record thus produced is to be employed later in a positive feed machine, it will be necessary that the record be placed in the same relation in the reproducing machine as it occupied in the record machine, and for this purpose, I may employ an eccentric projection 41 upon the record table for co-engagement with a corresponding recess upon the under side of the record. On the contrary, if a record of this kind be used upon a "Berliner" type of machine in which no positive feed is employed, such a positioning element and recess will not be necessary for this purpose, though it may be employed if desired in the recording machine for the purpose of holding the record blank steady while the record is being produced.

What I claim is:

1. In a machine of the character described, the combination with two elements, one comprising a record support and the other a stylus carrier, of means for imparting relative rotational movements and relative lateral movements between the two said elements, and means for also imparting lateral movements of reciprocation to one of the said elements with respect to the other.

2. In a machine of the character described, the combination with two elements, one constituting a record support and the other a stylus carrier, of means for imparting feeding movements to one of the said elements with respect to the other, means for simultaneously rotating the said record support, and means for simultaneously imparting movements of reciprocation to one of the said elements in the direction of said feeding movements.

3. In a machine of the character described the combination with a record sup-

porting element, a stylus carrying element, and means for rotating the record carrying element, of means for imparting lateral feeding movements to one of the said elements with respect to the other and for simultaneously imparting lateral movements of reciprocation to the stylus carrier in the direction of the said feeding movements.

4. In a machine of the character described, the combination with a record support, means for rotating the same, and means for simultaneously imparting lateral feeding movements thereto, of a stylus carrier, and means for imparting lateral movements of reciprocation to the said stylus carrier.

5. In a machine of the character described, the combination with a record supporting element, a stylus carrying element, and means for rotating the record carrying element, of means for imparting lateral feeding movements to one of the said elements with respect to the other, and a cam for simultaneously imparting lateral movements of reciprocation to the stylus carrier in the direction of the said feeding movements.

6. In a machine of the character described, the combination with two elements, one constituting a record support and the other a stylus carrier, of means for rotating the record support, and means including a feed screw and a cam for simultaneously imparting lateral feeding movements to one of the said elements with respect to the other and movements of reciprocation to one of the said elements with respect to the other, in the direction of the said feeding movements.

7. In a machine of the character described, the combination with a record support and a stylus carrier, of means for rotating the record support, and means for feeding the stylus across the face of a record supported by the said record support, and for alternately advancing and receding it during its feeding movement.

8. In a machine of the character described, the combination with a record carrier, means for rotating it, and means for simultaneously imparting lateral feeding movements thereto, of a tone arm pivoted about an axis at right angles to the face of the record carrier, a sound box carried thereby, and means for oscillating the tone arm about its pivotal support during the feeding movements of the record carrier.

9. In a machine of the character de-

scribed, the combination with a record support,—a carriage upon which the same is rotatably mounted, a rotatable feed screw connected with the said carriage, a drive shaft with which the said feed screw is connected to rotate, and means connecting the record support in rotative engagement with the said drive shaft, of a stylus carrier, and means in rotative engagement with the said drive shaft for imparting lateral movements of reciprocation to the said stylus carrier.

10. In a machine of the character described, the combination with record support, a carriage upon which the same is rotatably mounted, a stationary frame having a longitudinal guideway in which the carriage is arranged to slide, a feed shaft journaled in the said carriage and held against relative longitudinal movement with respect thereto, the said feed shaft having a threaded portion, a relatively stationary nut for engagement with said threaded portion, and gearing connecting the said feed shaft with the said record support, of a stylus carrier, and a cam in rotative engagement with the said feed shaft, for imparting lateral movements of reciprocation to the said stylus carrier.

11. In a machine of the character described, the combination with two elements, one constituting a record support and the other a stylus carrier, of means for imparting feeding movements to one of the said elements with respect to the other, means for simultaneously rotating the said record support, and an eccentric for simultaneously imparting movements of reciprocation to one of the said elements in the direction of the said feeding movements, the said eccentric being connected to rotate with the said record support but at a rate of speed which is a multiple of the rate of speed thereof.

12. In a machine of the character described, the combination with a record support, means for rotating the same, and means for simultaneously imparting lateral feeding movements thereto, of a stylus carrier, and means timed in relation to the movements of rotation of the record support, for imparting a plurality of complete lateral movements of reciprocation to the stylus carrier for each complete rotation of the record support.

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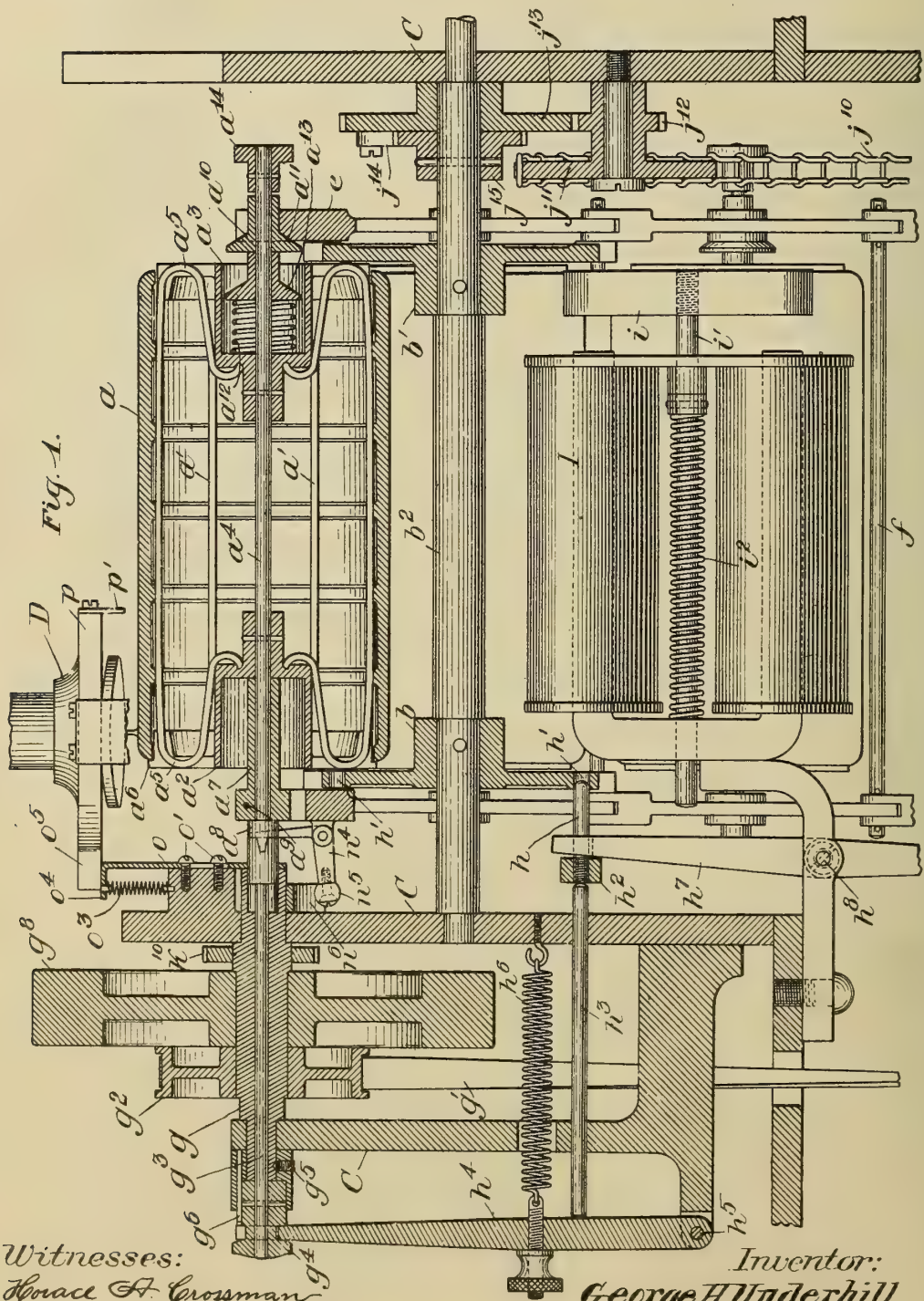
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G. H. UNDERHILL.
SOUND REPRODUCING OR SOUND RECORDING MACHINE.
APPLICATION FILED MAY 6, 1905.

995,390.

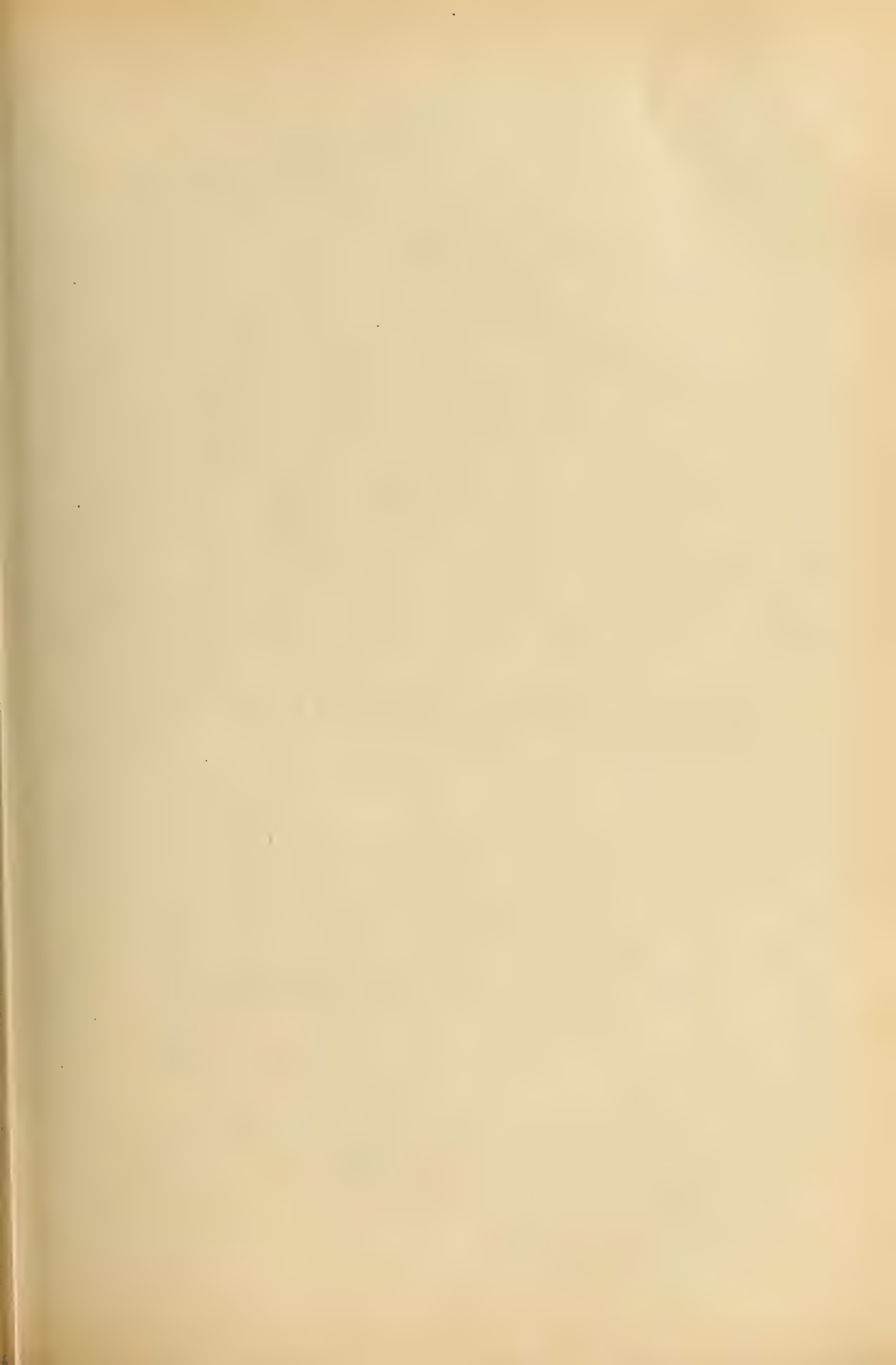
Patented June 13, 1911.

6 SHEETS—SHEET 1.



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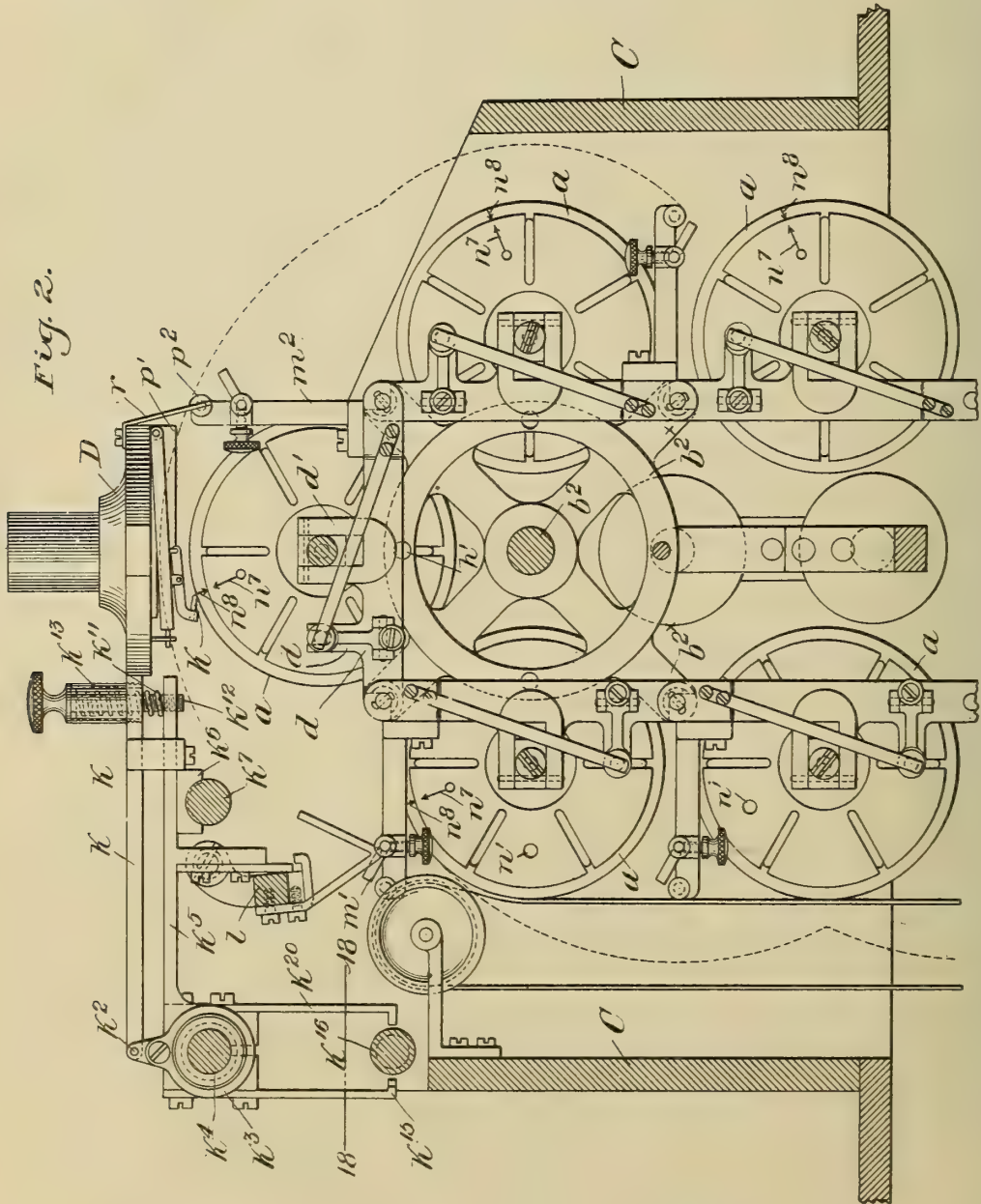


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6 SHEETS—SHEET 2.



Witnesses:

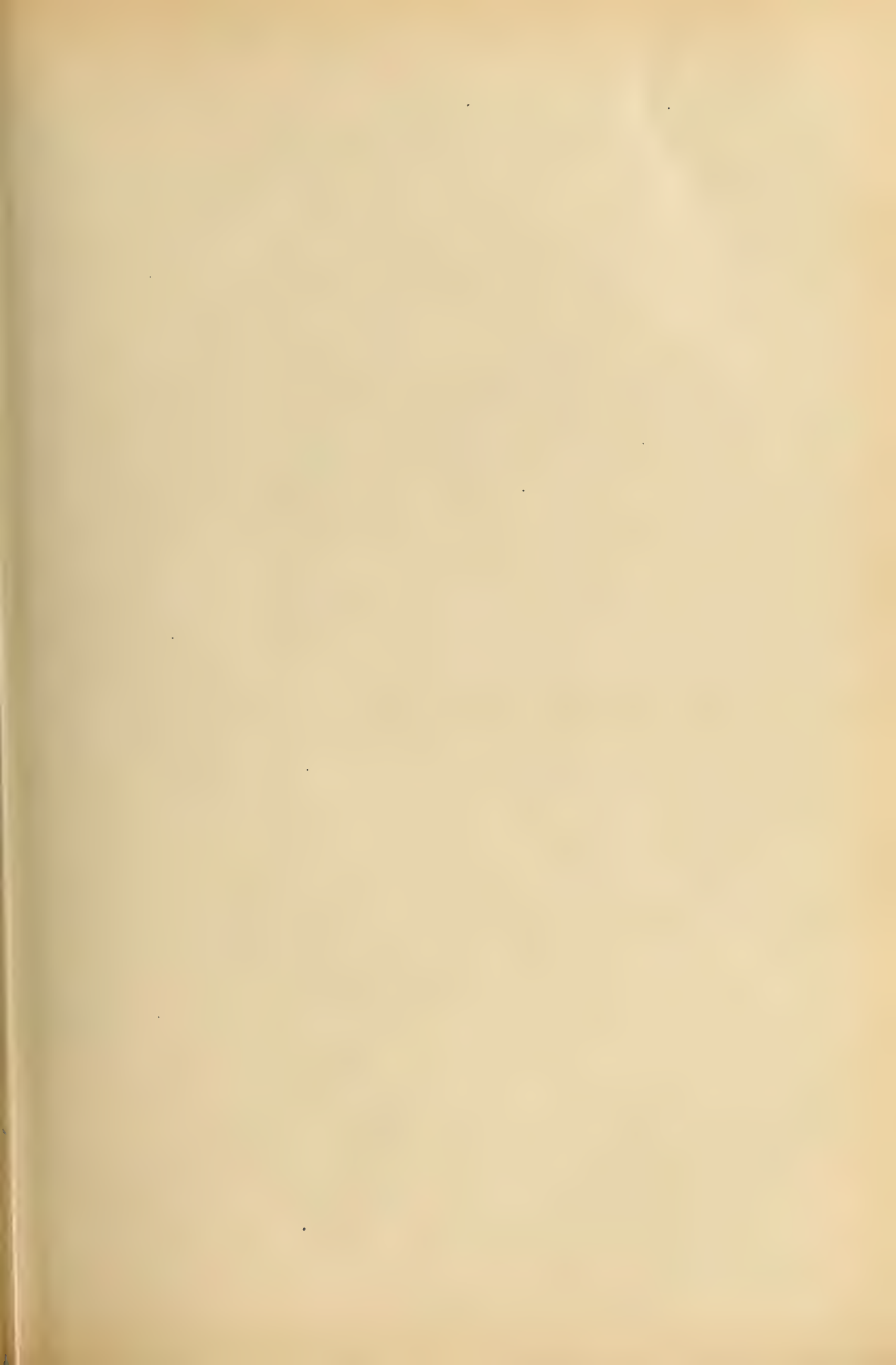
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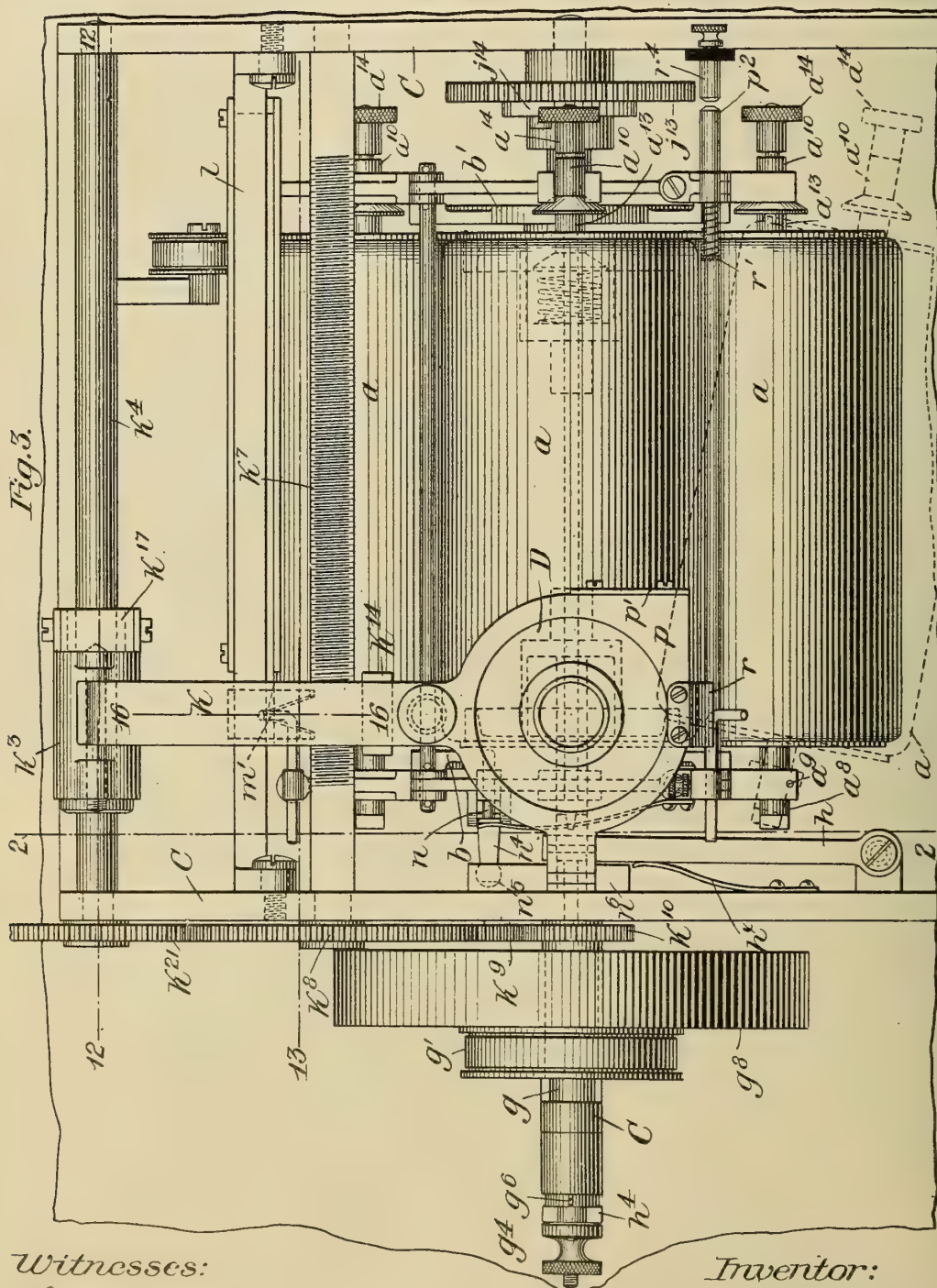
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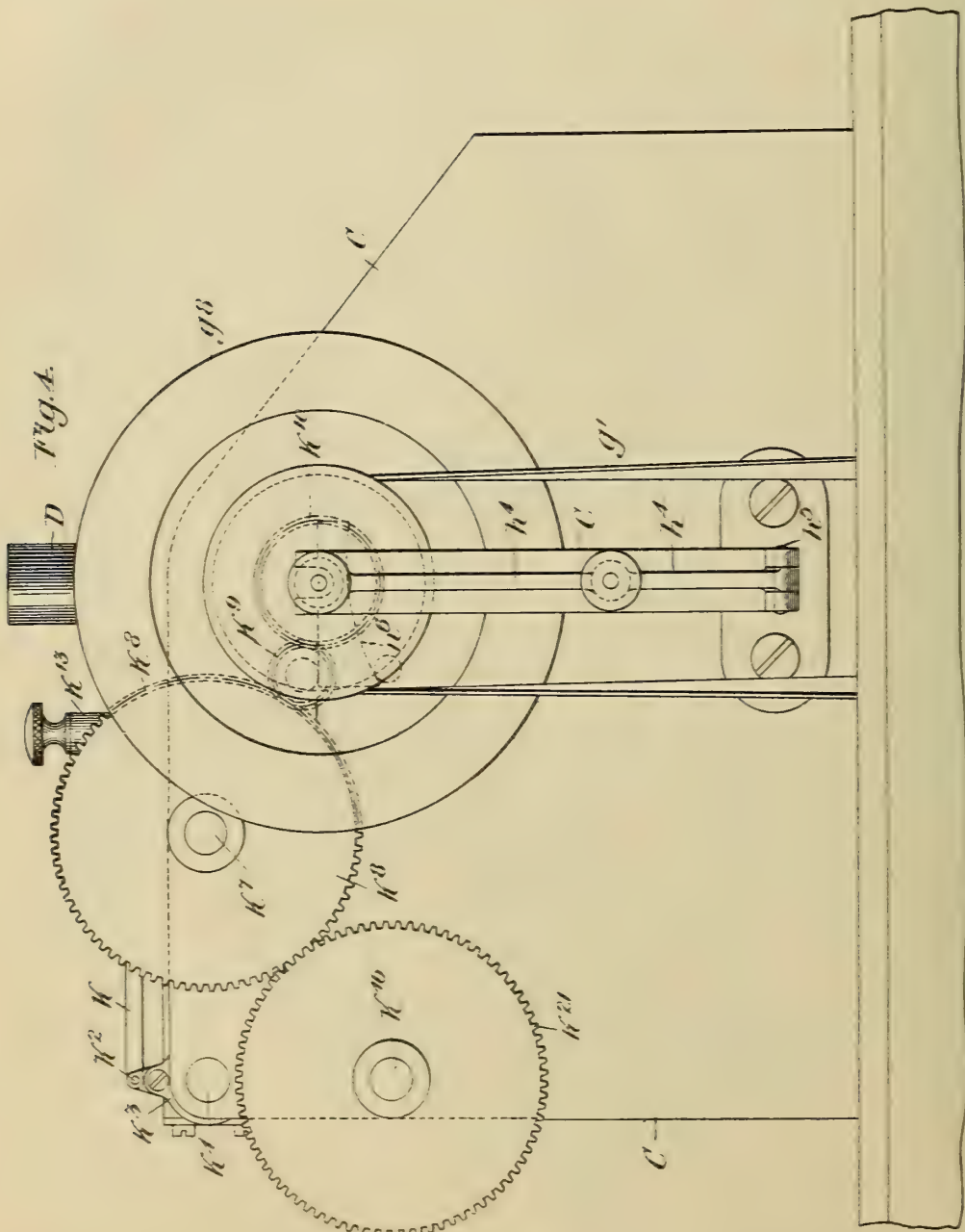


G. H. UNDERHILL.
SOUND REPRODUCING OR SOUND RECORDING MACHINE.
APPLICATION FILED MAY 6, 1905.

995,390.

Patented June 13, 1911.

6 SHEETS—SHEET 4.



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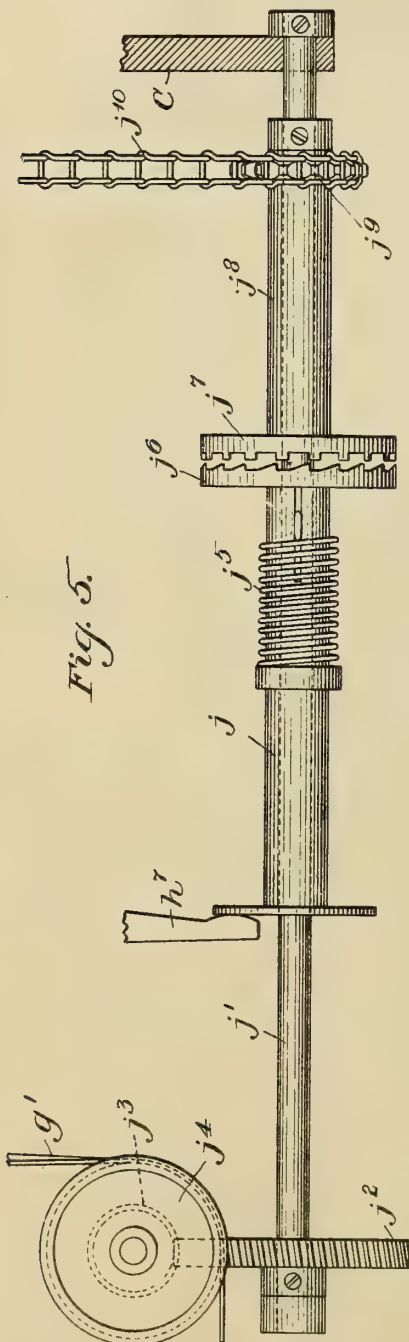


Fig. 5.

Fig. 7.

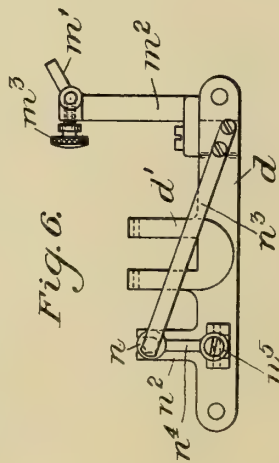
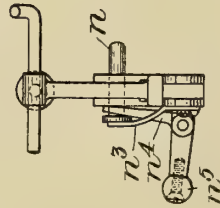


Fig. 6.

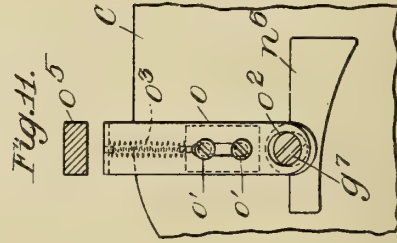


Fig. 11.

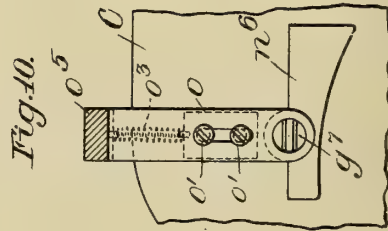


Fig. 10.

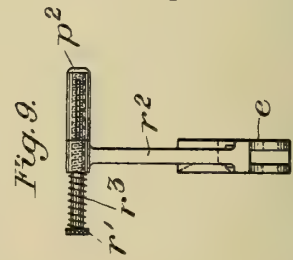


Fig. 9.

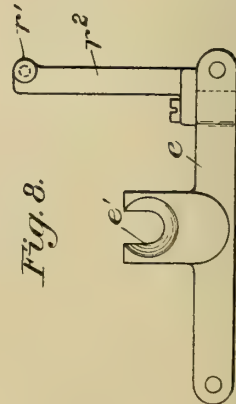
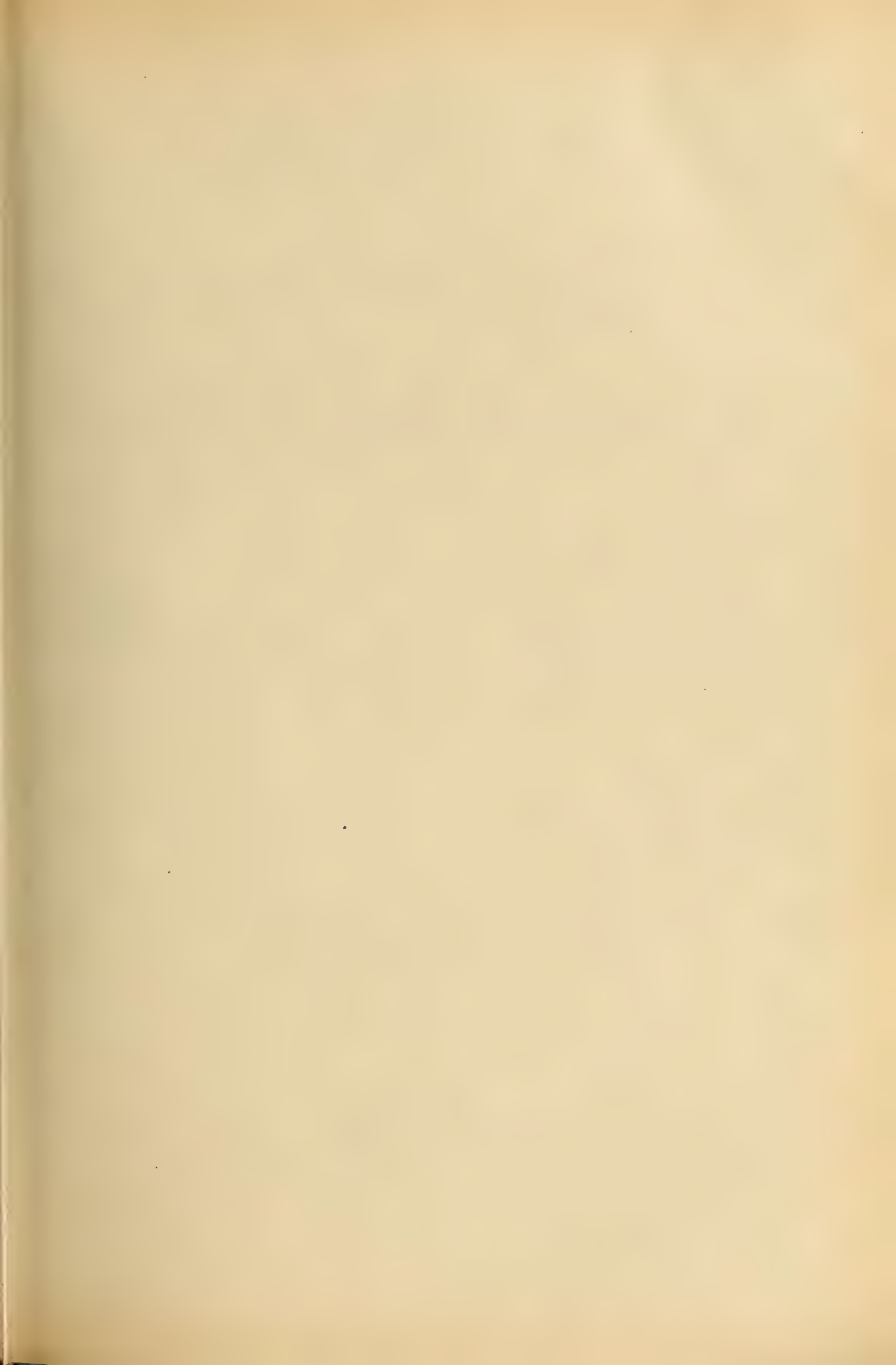


Fig. 8.

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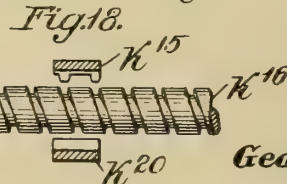
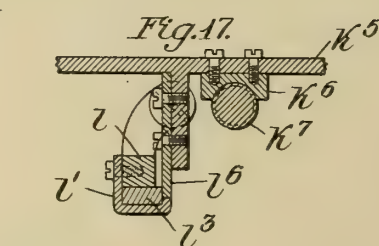
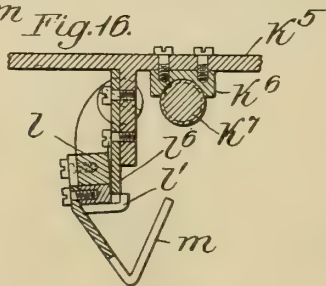
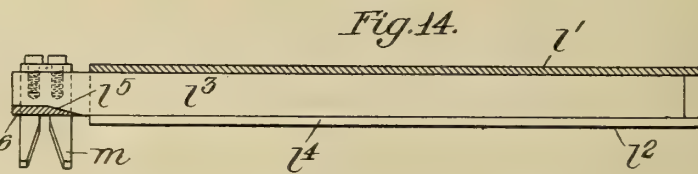
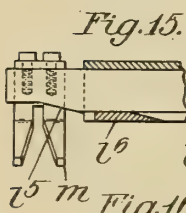
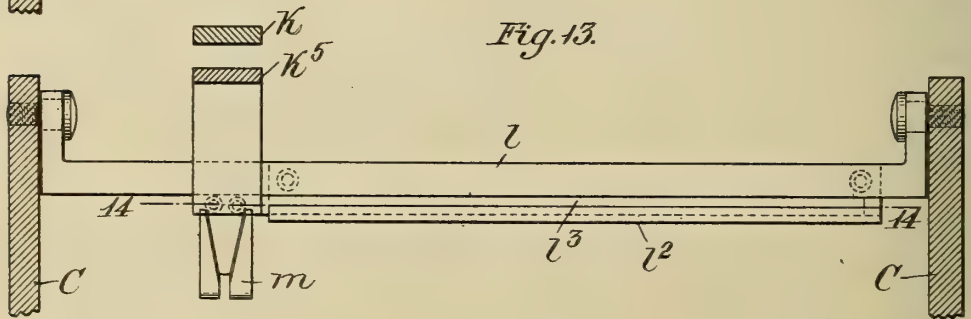
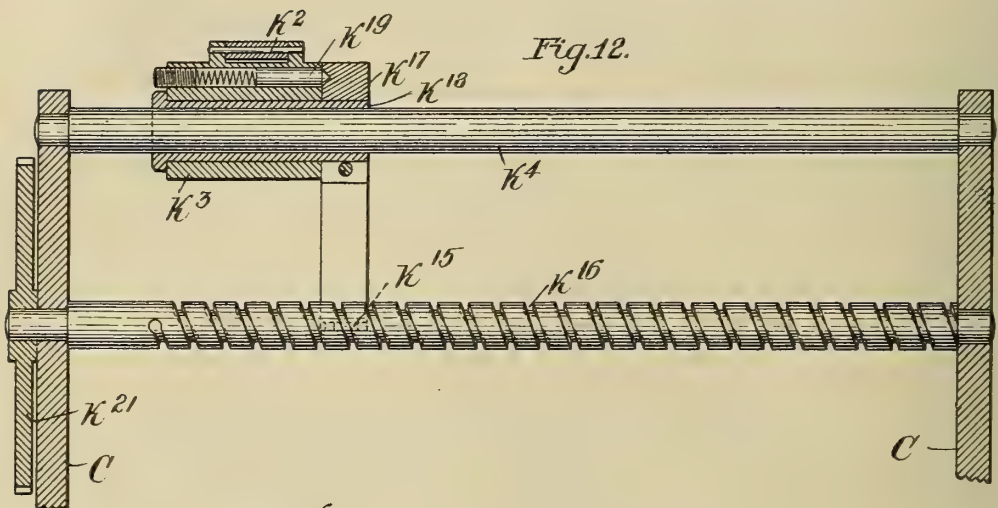


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6 SHEETS—SHEET 6.



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UNITED STATES PATENT OFFICE.

GEORGE H. UNDERHILL, OF BOSTON, MASSACHUSETTS.

SOUND-REPRODUCING OR SOUND-RECORDING MACHINE.

995,390.

Specification of Letters Patent. Patented June 13, 1911.

Application filed May 6, 1905. Serial No. 259,107.

To all whom it may concern:

Be it known that I, GEORGE H. UNDERHILL, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Sound-Reproducing or Sound-Recording Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention consists in improvements in sound reproducing or sound recording machines.

Many features of my invention have a useful application to many different types of such machines, including single record machines, but my invention on the whole is particularly applicable, and is herein illustrated with reference, to one type of multiple record machine having a plurality of cylindrical records supported by a linked carrying member, such records being automatically and successively brought into reproducing or recording relation to suitable reproducing or recording mechanism, the latter being caused to automatically traverse the face of each record as the same is presented.

My invention will be best understood by reference to the following description taken in connection with the accompanying illustration of one specific embodiment, while its scope will be more particularly pointed out in the appended claims.

In the drawings,—Figure 1 is a central sectional elevation of a portion of a sound reproducing machine embodying one form of my invention; Fig. 2 is a side elevation partly in section showing the machine of Fig. 1; Fig. 3 is a plan view partially broken away of the machine shown in Figs. 1 and 2; Fig. 4 is an end elevation of the machine shown in Fig. 1 looking from the left; Fig. 5 is an elevation of the underlying sprocket-wheel driving shaft arranged on the central plane of the machine but omitted from Fig. 1 through lack of space; Figs. 6 and 7 show in side view and end elevation respectively the construction of the inside links of the record carrying member or those links at the left in Figs. 1 and 3; Figs. 8 and 9 show similar views of the outside links or those at the right Figs. 1 and 3; Figs. 10 and 11 are details showing in side elevation the

sound box clutch controller in its clutched and unclutched positions respectively; Fig. 12 is a sectional elevation showing the construction of the sound box carriage and the return screw; Fig. 13 is a vertical section showing the depending sliding shoe at the end of the plate; Fig. 14 is a plan view in section on the line 14—14 of Fig. 13; Fig. 15 is a similar but fragmentary view showing the depending shoe during its return movement; Fig. 16 is a sectional elevation showing the shoe in a position corresponding to that shown in Fig. 14; Fig. 17 is a section showing the shoe in elevation in a position corresponding to that shown in Fig. 15; and Fig. 18 is a section on the line 18—18, in Fig. 2, showing the construction of the nut which engages the sound box return screw.

In the drawings for illustrative purposes I have shown the various features of my invention embodied in a multiple record phonograph having (Figs. 1 and 2) a series of record cylinders *a* journaled each upon the linked members of a pair of record-carrying chains passing over the separated sprocket wheels *b* and *b'* the latter fixed to rotate with the sprocket driving shaft *b²* which is mounted in the frame *C* of the machine, said records being brought one by one into an operative position beneath the sound reproducing mechanism *D* as the shaft *b²* is given an intermittent turning movement.

Referring first to the mounting of the individual records, there is provided an improved simple construction of support of minimum weight, but permitting the contraction of the record, under changes in temperature without fracture or other injury to the same, as well as the expansion of the record without loosening its grasp upon the support.

Referring more particularly to Figs. 1 and 2, support for the cylinder *a* is afforded by a series of elastic members *a'* arranged lengthwise the mandrel and radially with reference to the axis thereof, these being sufficient in number to accurately center the cylinder, while presenting to the core thereof a series of gripping members which are freely yieldable inwardly on contraction of the record.

One form of elastic mandrel is that illustrated in Fig. 1, the elastic members *a'* being constructed of round elastic steel wires arranged

chored or embedded in suitably positioned holes in the hub of the opposite but symmetrically arranged mandrel supports a^2 , a^3 , the latter being keyed to the record-turning shaft a^4 . Before contacting with the core of the record cylinder a , they are caused to bow outwardly at a^5 into or through radially formed slits in the flanged portions of the supports a^2 , a^3 , which slits act to space and position the wires and to allow the ready yielding thereof under contraction of the record.

The record when slipped over the mandrel is self seating and will be firmly held thereon irrespective of its position and whether pushed on entirely or partially. This construction permits the record to be pushed to any predetermined position on the mandrel and there effectively retained, this being in contrast to prior forms of tapered mandrels where the record must be pushed to a seat upon its tapered support regardless of where that leaves the record lengthwise the mandrel. This permits a record to be played in the same position upon its support as it was cut and, after withdrawal to be replaced upon the same, or on a different mandrel, always in the same longitudinal position. For the purposes hereinafter referred to, on the illustrated machine the record is preferably pushed to a fixed position determined by the out-turned lip a^6 on the inner flanged support a^2 .

A mandrel constructed as described may be relied upon to center the record cylinder with an accuracy sufficient for ordinary purposes, but, if desired, the flanged supports may be made to fit the outer ends of the record core with a small clearance, such, for example, as five one thousandths of an inch, so that no greater eccentricity can occur than that allowed by such clearance, which I have found negligible, while this allows for the necessary contraction of the record under changes of temperature.

For the best results, the records are preferably reamed at their inner ends, where they loosely fit the periphery of the flanged supports, to render the outer faces concentric with the inner bearing faces, thereby avoiding eccentricity in the record itself which I have found a common fault with commercial records.

The record turning shaft at that end which I term the inner end passes through the mandrel support a^2 and an elongated journal sleeve a^7 terminating in the suitably notched head a^8 , which latter at the proper time is clutched by the record driving mechanism hereinafter described.

The sleeve a^7 is hinged or pivoted at a^9 between the arms of the upturned fork d' (Figs. 2 and 6) in the link d of the inner record-carrying chain or that passing over the sprocket b (see Figs. 1, 2, 6 and 7) so

that the mandrel and its record, when released at the opposite link, can be swung outwardly about the fulcrum, a^9 as is shown in dotted lines in Fig. 3.

The outer end of the turning shaft a^4 is journaled in the sliding collar a^{10} , fitting the open mouthed pocket e' (Figs. 1 and 8) in the link e of the outer chain, or that passing over the sprocket b' . The collar a^{10} has a beveled shoulder a^{11} which bears against the correspondingly shaped inner face of the pocket e' , being forced against the same by the pressure of the spiral retaining spring a^{12} acting through the washer a^{13} . The bevel of the shoulder a^{11} upon the collar a^{10} is such that when the latter is seated in its pocket it is firmly held there by the spring a^{12} and the mandrel is securely held in accurate alinement upon the chain carrier. If the overlying end of the turning shaft a^4 , which can be readily and manually seized, is lifted away from the link, the beveled collar will snap out of its seat and the mandrel can be swung outwardly clear of the link e for withdrawal of the record. The sleeve a^{14} , pinned to the shaft a^4 permits the collar a limited movement only, so that after effecting the desired change, when the shaft is again moved toward the link, the collar easily snaps into the pocket. Changes in the records will of course ordinarily be effected when the record is in an inoperative position, away from its position of engagement with the sound reproducing mechanism D.

The collar a^{10} and the washer are made in separate pieces, as shown, for the purpose of retarding the rotation of the record by the friction of the engaging surface of these two parts sufficiently to avoid a rotary movement of the record under its own inertia.

The successive links of each chain are constructed alike, each link being forked at one end to receive the end of the next adjacent link, to which it is pivotally secured by the pivotal tie rods f , which pass entirely through from one chain to the other. Each sprocket is provided with four projecting teeth b^{2x} (Fig. 2) which are suitably notched to receive the tie rods f , so that each link is supported by its sprocket at two points through engagement of the tie rods f therewith and through engagement with such tie rods only.

Referring again to Fig. 1, the record driving or turning mechanism is carried upon the sleeve g , suitably journaled in the frame C and given a constant rotary movement through the belt g' and the pulley g^2 , the latter secured to the said sleeve to drive the same. The mandrel driving shaft g^3 which is clutched to the mandrel to drive the same, is slidably mounted within the sleeve g and is pinned at its outer end to a grooved collar g^4 . Movement is communicated from the driving sleeve g to the mandrel driving

shaft g^3 through the hollow coupling g^5 secured to the outer end of the said sleeve and provided with an internal key-way, with which engages a key g^6 upon the grooved collar g^4 , permitting sliding movement of the latter while causing the rotation of the mandrel driving shaft g^3 . The opposite end of the driving shaft g^3 is provided with a clutching head suitably notched to engage the correspondingly projecting head a^5 of the mandrel shaft a^4 when in the position shown in Fig. 1, but adapted to be withdrawn into a pocket formed in the end of the said sleeve g when the collar g^4 is drawn outwardly to unclutch the mandrel shaft a^4 and permit the sprocket wheels to turn for shifting the records.

I have found a marked improvement in the quality of the sound reproduction when the rotative movement of the record is perfectly uniform and this I have also found can be attained by increasing the mass of the parts to give a fly wheel effect thereto. To this end I preferably make use of the balance wheel g^8 of relatively great mass compared with that of the record and here shown secured to the driving sleeve g to rotate therewith and impart thereto a steadiness and uniformity of movement.

At each shifting of the records it is necessary that the record carrier should be positively and correctly alined with reference to the sound reproducing mechanism and I have therefore provided the machine with a locking and alining means comprising the locking pin h (Fig. 1), which is adapted to enter one of the four properly positioned holes h' (Fig. 2) in the sprocket when the latter is turned to bring a fresh record in its correct position and there lock the same until the pin h is again withdrawn. The pin h is carried (Fig. 3) by the horizontal swinging locking bar h^2 pivoted to the frame of the machine, the device h being pressed toward the face of the sprocket by the pressure of the leaf spring h' acting against the bar h^2 .

Pressing against the bar h^2 (Fig. 1) is the horizontal sliding rod h^3 contacting at its outer end with the side of the upright arm h^4 pivoted to the machine frame at h^5 and pressed constantly against the rod h^3 by the adjustable spiral tension spring h^6 . The free upper end of the arm h^4 is forked and embraces the groove in the overhead collar g^4 on the driving shaft g^3 , whereby an outward swinging movement of the arm will cause retraction of the sliding driving shaft and the disengagement of the head g' from the mandrel shaft.

After a record has been played suitable controlling means are automatically actuated, causing simultaneous disengagement of the locking pin h , from the sprocket and the clutching head g' from the mandrel turning

shaft and effecting at the same time the turning of the sprockets to shift the records. This operation may be effected in a great variety of ways, but as illustrative of one embodiment of my invention, I have shown the electromagnet I located beneath the sprocket shaft. On the completion of the playing of a record the electro-magnet is energized through means hereinafter described, causing the attraction of the armature i attached to the sliding rod i' , the said armature being normally held away from the poles of the magnet by the compression spring i^2 . This causes the opposite end of the sliding armature rod i' to contact with the upright lever h^7 pivoted on the machine frame at h^8 and to swing the free end of the upright lever against the horizontal locking bar h^2 causing the withdrawal of the latch h from the sprocket and causing at the same time the outward movement of the sliding rod h^3 against the vertical swinging lever h^4 simultaneously to unclutch the driving shaft g^3 and free the mandrel preparatory to the movement of the sprocket.

Referring now to Fig. 5 the lower end of the upright lever h^7 bears against a flange on the rotary sleeve j pinned to but slidable on the shaft j' , which is journaled in the machine frame beneath the magnet I and is given a constant rotary movement by means of the worm gear j^2 and the worm j^3 , the latter being driven by the pulley j^4 over which passes the belt g' carried to and driven by a spring motor (not shown) or any other suitable source of motive power. When the lever h^7 is swung about its fulcrum by energization of the magnet as described, its lower end forces the sleeve to the right as viewed in Fig. 5 against the opposing pressure of the spring j^5 causing the toothed clutch disk j^6 to engage a similar toothed disk j^7 on the loose sleeve j' . The latter carries a sprocket wheel j^8 and acts, on engagement of the clutch disk, to rotate the overhead sprocket wheel j^{11} (Fig. 1) through the driving chain j^{10} . The sprocket wheel j^{10} is fast on a sleeve carrying also the pinion j^9 , the latter engaging the gear j^8 loose on the main sprocket shaft b^1 but carrying the pawl j^{11} which bears against the teeth of the gear j^8 to turn the latter and thereby the main sprocket shaft when the two clutch disks are engaged as described.

Although the magnet I is de-energized immediately after the beginning of the record-shifting movement the retracted latch pin h which continues to be pressed out by the face of the moving sprocket b , holds the driving shaft g retracted and the clutch disks j^6 and j^7 engaged until the next record is brought into a position of alignment, when the pin finds and enters the next aligning hole h' locking the sprocket in its cor-

rect position and at the same time releasing the lever k^7 to permit the unclutching of the disks j^6 and j^7 which follows under the action of the spring j^5 , and also releasing

5 the swinging arm k^4 .

During the shifting of the records the stylus which has been automatically lifted from the face of the record, is traversed back to its initial position and again

10 dropped into engagement with the record at the beginning of the record groove.

The sound box D may be of any suitable construction being provided with the usual diaphragm and attached stylus K, the latter

15 positioned for engagement with the record groove. The sound box D is supported at the end of the horizontal arm k , which is pivoted at k^2 to the sliding sound box carrier k^3 , the latter (Figs. 2, 3 and 12) being

20 slidable along the rod k^4 at the rear of the machine. The carrier k^3 is traversed in its advance or reproducing movement by means of the forwardly projecting horizontal arm k^5 , attached to the carrier and provided near

25 its forward end with the segmental nut k^6 , which engages with the upper face of the finely threaded screw k^7 . The feed screw k^7 is constantly rotated to advance the stylus when the nut k^6 is in engagement with said

30 screw by means of the gear k^8 (Figs. 3 and 4) secured at the end thereof and outside the machine casing: the gear k^8 being driven through the idler k^9 and the driving feed pinion k^{10} ; the latter (Fig. 1) being mounted

35 directly on the driving sleeve g .

The sound box is given an adjustable spring support upon the arm k^5 through the intervention of the spiral spring k^{11} .

The latter rests upon the arm k^5 about the threaded stud k^{12} and is carried in the hollow cap k^{13} which is adjustably threaded

40 into the arm k , whereby turning of the cap will adjust the sound box relatively to the arm k^5 . A forked guiding piece is secured to the arm k^5 and with its upturned ears embraces the arm k to prevent lateral displacement thereof.

When the sound box reaches the end of the record it is automatically lifted, as will be described, and this causes withdrawal of the nut k^6 from the feed screw k^7 , the stoppage of the advance feed and at the same time the engagement of the depending segmental nut k^{15} with the coarse threaded return feed screw k^{16} at the rear of the machine and beneath the carrier shaft k^4 . The nut k^{15} (Figs. 2, 12 and 18) is secured to the overhead collar k^{17} , fast to the sleeve or bushing k^{18} , slidable along the shaft k^4 and loosely fitted within the carrier k^3 .

The normal position of the nut relatively to the carrier k^3 , which is shown in Fig. 2, is maintained by the spring pressed pin k^{19} , the pointed end of which fits a correspond-

65 ingly shaped depression in the opposing face

of the collar, the bevel of the pin point, however, being such that the carrier may be turned relatively to the collar and the pin snapped away from its seat, thus permitting the sound box with its arm and feeding nut k^6 to be swung upward and backward out of the way for inspection of the machine or for any other purpose, while still leaving the nut k^{15} depending in the position shown in Fig. 2. When the sound box is swung forward again into position, a positioning arm k^{20} also depending from the collar k^{17} holds the latter in substantially its normal position until the pin k^{17} snaps into its seat in the collar.

The spring-pressed pin k^{19} also assists in enforcing engagement of the nut k^{15} with the return feed screw k^{16} , for, if the threads of the screw are not in such a position as to permit the nut to drop into the same when the stylus is lifted from the record, the pin k^{19} is forced against its spring and the pressure thereof tends to force the nut into engagement as soon as the screw turns far enough to permit this.

The coarse threaded return feed screw k^{16} is given a movement the reverse of the advance screw k^7 by means of engagement between the gear k^{21} (Figs. 3 and 4) fast upon the screw k^{16} and the gear k^8 upon the advance feed screw k^7 .

An important feature of my invention is the provision of means whereby the stylus may be dropped into the first groove at the commencement of reproduction and whereby this is accomplished with each of the records of the series irrespective of differences in the cutting of the records, also in the provision of means for raising the stylus from the record immediately after the last note is played and with each record of the series. This not only insures the elimination of the hissing noise usually preceding and following the playing of a record, but also avoids the unnecessary lapse of time between the playing of the records.

The controlling device for dropping the stylus on its return movement at the appropriate time and place is carried by a swinging stirrup l (Figs. 1 and 13 to 17) extending across the machine and pivoted by its upturned ends to the frame thereof. To this stirrup is secured the guide plate l' of an L shaped section having the upturned lip l^2 and supporting the sliding controlling plate l^3 , the latter having a straight vertical front edge l^4 for a greater portion of its length, but terminating at one end in the beveled recessed portion l^5 .

Fixedly secured to the feeding arm k^5 is the depending controlling shoe l^6 so positioned that during the advance of the stylus the straight edge of the controller plate l^3 lies against the side of the shoe near its lower edge, as shown in Fig. 17.

When the stylus reaches the end of the record, however, and is lifted, the shoe l^6 is raised clear of the plate l^3 , and the latter, carried by the swinging stirrup gravitates beneath the lower edge of the shoe so that when the stylus is released by the lifting mechanism the shoe is deposited and caused to return upon the upper face of the plate l^3 near its outer edge, the sound box being thereby sustained at such an elevation as to cause the stylus to clear the record and the nut l^6 to be disengaged from the advance feed screw l^7 . At the instant when the shoe reaches the recessed portion l^5 upon the plate it drops into such recessed portion (see Figs. 14 and 16), lowering the stylus, disengaging the nut l^{15} from the return feed screw, and again starting the advance of the reproducing mechanism. The advanced edge of the shoe is beveled to correspond to the bevel l^5 upon the plate and as the shoe advances with the sound box it swings the plate with its stirrup back from the position shown in Fig. 14 to that shown in Fig. 15, so that it assumes the position shown in Fig. 17 during the reproduction of the record. The position of the sliding plate l^3 therefore determines the dropping of the stylus and this I have rendered automatically adjustable with respect to the commencement of the record groove in each individual record of the series so that wherever the groove starts relatively to the end of the record the stylus will there be dropped and at no other place. This is effected by the V-shaped controller positioning device m having a flared opening positioned approximately in the path of travel of the out-turned end of the series of pins m' , the latter being adjustably secured to the upright arm m^2 upon each of the record-carrying links d (Fig. 6). The pin m' may be secured in its link by any suitable means, as by the set screw m^3 and there accurately adjusted with reference to the commencement of the sound groove of that record which is carried by the next succeeding link. As the records are shifted, the positioning pin upon the link which is carrying its record out of operative position is caused to sweep through the flared opening of the positioning device and center the said device in its line of travel, thereby positioning the controlling plate l^3 so as to drop the stylus exactly in the commencement of the groove of the next record.

By previously adjusting the positioning pin m' corresponding to each record with reference to the first groove therein, the stylus will be dropped into the first groove of each record when the latter is presented to the sound reproducing mechanism, irrespective of variations in the cutting of the different records and, no matter how often the records are reproduced or are withdrawn from and replaced upon their mandrels.

In the illustrated machine there is provided not only the described means for dropping the stylus into the first groove of the record, but also for dropping the stylus into the beginning of that groove. For this purpose the records advancing toward the operative position are held against rotation by mandrel-locking means and presented to the stylus with the beginning of the record groove directly beneath the line of travel of the stylus, the lock being then withdrawn to permit rotation of the record, which follows as soon as the stylus is lowered.

The mandrel locking means comprises a locking pin n (Figs. 3 and 7) carried by the link d and adapted to enter a locking recess n' in the inner face of the flanged mandrel support a^2 . The pin n is slidably mounted in the upright member n^2 of the link b , being pressed toward the mandrel by the leaf spring n^3 . The locking pin n is withdrawn from the mandrel as the record reaches its uppermost and operative position, by the forked end of the bell crank lever n^4 pivoted to the side of the link, the withdrawal of the link being effected by contact between the opposite spherical end n^5 of the lever arm and the under face of the stationary cam n^6 (Figs. 1, 4, 10 and 11) secured to the inner side of the machine frame. As the record moves into operative position, the spherical head rides upon the cam, causing the latter to withdraw the locking pin and free the mandrel for rotation, the latter, however, being still positioned against accidental movement by the friction between the collar n^{11} and the washer n^{13} .

The mandrel is provided with a reference or index mark, such as the zero mark, n^7 (Fig. 2), and each record after being cut, is provided with a corresponding reference mark n^8 , alining with the beginning of the record groove. The mandrel index mark is so located with reference to the locking recess n' that when the record is pushed upon the support with its reference mark registering with the reference mark upon the mandrel, the locked mandrel will bring the first part of the groove, directly beneath the line of travel of the stylus.

After a record is played the record may be restored to its zero position and there locked in any desired way, but in the described embodiment of my invention I have provided the friction band n^9 against which the records contact as they travel away from the operative or reproducing position. By this contact they are turned slightly at each record shift and in the course of its intermittent turning each record will finally be locked in its zero position by the locking pin n finding its locking hole in the mandrel flange.

The timing of the movements is preferably such that the record shifting is completed before the stylus returns to the drop

ping point however far from the initial position of the record its groove begins. In order to prevent the record from being turned during the interim, I have provided 5 the slidable locking plate o (Figs. 1, 10 and 11), which prevents the clutching movement of the driving shaft g^3 , even though the latter be released by movement of the locking bar h^2 , until the stylus is dropped for engagement with the record. The plate o is 10 slotted to slide with a limited movement upon the pins o' , and has an opening o^2 , which in the lowermost portion of the plate registers with the clutch head g^7 . The plate 15 o is normally pressed upward, and toward the position shown in Fig. 11, by the spring o^3 , located between the frame of the machine and the overturned end o^4 of the plate, but is pressed downward into the position shown 20 in Fig. 10, by the overhanging lug o^5 , upon the sound box D, when the latter is lowered as indicated in Fig. 1. When the clutch head g^7 is retracted to release the mandrel preparatory to the shifting movement, the 25 plate moves upward, locking the clutching head in its pocket from which it cannot emerge until the plate is pushed downwardly by the weight of the sound box as the stylus is lowered. When the stylus 30 drops into the record groove, the released clutching head engages the mandrel and the latter, on account of the relatively great inertia of the fly wheel g^8 , immediately assumes the uniform speed of the latter.

35 To withdraw the stylus from the record, the sound box D is provided with the overhanging extension p , to the advanced face of which is secured the depending plate p' (Figs. 1 and 3), the lower edge of the latter 40 being engaged and raised by a lifting pin p^2 , one of which is carried by each of the outer carrying links e . As soon as the shifting movement of the sprocket begins, the lifting pin, which has a line of travel indicated by dotted lines in Fig. 2, meets the 45 lower edge of the plate p' and raises the stylus, the controller plate l^3 thereupon swinging under the shoe l^6 . After the sprocket is turned and the pin withdrawn 50 from the plate p^2 , the shoe l^6 , resting upon the controller plate, supports the sound box during its return movement.

In order that the record shifting movement, and, therefore, the withdrawal of the 55 stylus, may take place immediately on the completion of the last note of the record, the traveling sound box is provided (Figs. 2 and 3) with the depending stop finger r , which, just before the completion of the record, is 60 caused to meet the end of the adjustable and yieldable stop pin r' . The latter (Figs. 8 and 9) is threaded into the lifting pin p^2 and slidable in a head formed upon the upright arm r^2 at the rear end of the link e . The 65 pin r' is normally pressed outward, as shown

in Figs. 3 and 9, by the spring r^3 , but, when engaged by the finger r , is moved with the sound box to cause contact between the lifting pin p^2 and the stationary contact pin r^4 , 70 attached to but insulated from the frame of the machine. The stationary contact is connected through circuits (unnecessary to show) with the magnet I and a suitable source of current, the other terminal of the 75 circuit being grounded to the frame of the machine, so that, on contact between the contact r^4 and the pin p^2 , which latter is of conducting material, the circuit is completed and the magnet energized for starting the 80 shifting movement, as has been described. Upon withdrawal of the pin r' , the latter again assumes the position shown in Fig. 3, thereby deenergizing the magnet.

The threaded adjustment of the pin r' within the locking pin p^2 , permits the ad- 85 justment of the former with reference to the termination of the record groove in each individual record, so that the closure of the controlling circuit will take place at the proper instant in the travel of the stylus 90 to withdraw the latter from the record when the last note has been played.

In the machine described the playing of the records follow one another rapidly in 95 succession with no other interval than that required for the return of the stylus. The coarse threaded screw shown may be relied upon to return the stylus with sufficient 100 rapidity for ordinary purposes but my invention is not necessarily limited to the specific form of stylus return mechanism shown and if a still quicker return is desired other means for effecting this may be employed.

It will of course be understood that many 105 features of my invention herein described are applicable to types of sound reproducing or sound recording machines other than the one which is here taken for purposes of illustration, and that such features of my invention either modified or as described, 11 may be applied to such machines without reference to the presence or absence of the remaining features of said invention. It will also be understood that while I have 115 described with considerable detail for illustrative purposes one practical embodiment of my invention, the same is not limited to the details described, or the form, relation, or construction of parts, but that many and wide modifications may be made therein without departing from the spirit of my invention.

It is also to be understood that, while the illustrated machine employs a traveling stylus with a stationary record support, and adjustment of the engagement between the stylus and the record is attained by adjusting or regulating the movement of the stylus, the reverse of these relations and conditions, as well as variations and modifications in the 120

means by which the object is attained, are within the scope of my invention; it being obvious, for example, that the stylus might remain stationary and the record caused to travel.

Furthermore, although the machine illustrated is capable of and may be employed for regulation of the stylus movement to engage the record at the beginning of the groove thereof and withdraw therefrom at the end of the groove, my invention is not limited to the attainment of that precise condition; the engagement with the stylus may occur before the beginning of the groove and disengagement take place after the ending of the groove, it being within the scope of my invention to regulate the action of the stylus upon the record in any desired way with reference to the character of the groove impressed thereon.

I claim—

1. A multiple record sound-reproducing machine having means providing for a period of stylus engagement with the individual records proportioned in each case to the length of the sound groove therein.

2. A multiple record sound-reproducing machine having means providing for a period of stylus engagement with the individual records thereof automatically proportioned in each case to the length of the respective records.

3. A multiple record sound-reproducing machine employing a stylus and having a stylus controller, means for presenting to the stylus in succession the individual records of the machine, the control of the stylus by the said controller being dependent upon the location on the record of the beginning of the record groove or impression.

4. A multiple record sound-reproducing machine employing a stylus and having a stylus controller, means for presenting to the stylus in succession the individual records of the machine, the control of the stylus by the said controller being dependent upon the location on the record of the ending of the record groove or impression.

5. A multiple record sound-reproducing machine employing a stylus and having a stylus controller, means for presenting to the stylus in succession the individual records of the machine, the control of the stylus being dependent upon the differing character of the record groove or impression in the respective records.

6. A multiple record sound-reproducing machine having means for throwing the stylus in and out of engagement with the record, and means automatically adjustable with reference to each record for causing engagement thereof at the beginning of the record groove.

7. A multiple record sound-reproducing machine having means automatically to ad-

just the engagement of the stylus with the separate records with reference to the beginning of each record groove.

8. A multiple record sound-reproducing machine having a record-carrier, a stylus, and means upon said carrier for each of the several records thereof to determine the travel of the stylus for its respective record.

9. A multiple record sound-reproducing machine having a stylus and adjustable stylus-controlling means for each of the several records thereof.

10. In a multiple record sound reproducing machine the combination with a movable record carrier of means for causing the withdrawal of the stylus from the record on movement of said carrier and means adjustable for individual records for setting the carrier in motion.

11. In a reproducing machine having a movable record carrier for bringing successive records into position, means depending upon the character of each individual record for moving the carrier.

12. In a multiple record sound-reproducing machine, the combination with a movable record-carrier, and means for the several records adjustable each with reference to the ending of its respective record groove for setting said carrier in motion.

13. In a multiple record sound-reproducing machine, the combination with a movable record-carrier, of means for causing the withdrawal of the stylus from the record on movement of said carrier, and means for each record thereof adjusted with reference to the ending of its record groove for setting the said carrier in motion.

14. In a multiple record sound-reproducing or sound-recording machine, the combination with a stylus, a plurality of rotatable records, and means for presenting each record for successive engagement with the stylus in a predetermined position upon its support.

15. A multiple record sound reproducing machine having a plurality of rotatable records adapted for successive engagement with the sound reproducing mechanism, and means for holding the records against rotation prior to engagement with the sound reproducing mechanism.

16. A sound-reproducing or sound recording machine having a rotatable record, means for holding the record against rotation, and means for automatically releasing the same for rotation.

17. A multiple record sound reproducing or sound recording machine having a plurality of rotatable records, means for holding the records against rotation, and means for releasing the same prior to engagement with the stylus.

18. A multiple record sound reproducing machine having a plurality of rotatable rec-

ords, means for presenting each record for successive engagement with the stylus in a predetermined position upon its support, and means for restoring the record to its predetermined position before reengagement with the stylus.

19. A multiple record sound-reproducing machine having a plurality of rotatable records, means for locking the several records against rotation prior to engagement with the stylus, means for releasing the same, and means for re-locking the said records before reengagement with the stylus.

20. A multiple record sound reproducing machine having means for automatically varying the position of stylus engagement for successive records.

21. A multiple record sound reproducing machine having means for automatically varying the position of stylus disengagement for successive records.

22. A multiple record sound-reproducing machine having means for varying in consecutive records and with reference to the character of the successive sound records the position of stylus engagement or disengagement on the record, and means for presenting to the stylus in succession the individual records of the machine.

23. A multiple record sound-reproducing machine having record turning means, means for causing engagement between said turning means and successive records, and means for preventing engagement of said turning means with a freshly presented record prior to engagement of the stylus therewith.

24. A multiple record sound reproducing machine having record turning means, means for controlling disengagement of said turning means from the record with reference to the beginning of the record shifting movement, and means for controlling the engagement thereof with the record with reference to the point of engagement of the stylus therewith.

25. A multiple record sound reproducing machine having a plurality of records, record turning means adapted while in motion for engagement therewith and disengagement therefrom and a member of relatively great mass rotatable with said record driving means.

26. A multiple phonograph having a linked record carrier and stylus positioning means upon the individual links thereof.

27. A multiple phonograph having a linked record carrier and stylus withdrawing means upon the individual links thereof.

28. A multiple phonograph having a record carrier for shifting the records and means movable with the carrier for controlling the record shifting movement of the carrier.

29. A multiple phonograph having a

linked record carrier and adjustable means for controlling the shifting movement of the records upon the links thereof.

30. A multiple phonograph having a linked carrier comprising pairs of oppositely arranged links, a hinged record support upon one link and an open-ended pocket in the opposite link.

31. A multiple record sound reproducing or recording machine, having a plurality of record supports, a fly wheel and means for attaching the fly wheel to and detaching it from the individual record supports.

32. A multiple record phonograph having a plurality of skeleton record supports, driving means, and a fly wheel connected with said driving means and adapted to be connected to and disconnected from the individual record supports.

33. A sound reproducing machine having a sound box, means for advancing the sound box and means for returning the same, and a yieldable connection between said advancing and return means.

34. A sound reproducing machine having a sound box, an advancing feed screw, a return feed screw, a member attached to said sound box engaging said advancing feed screw, another member also attached to said sound box for engaging said return feed screw, and a yieldable connection between said members.

35. A sound reproducing machine having a traveling sound box and a swinging support therefor attached to the machine and means attached to said sound box for engagement with said support, said support being adapted to swing beneath said engaging means when the sound box is lifted.

36. A sound reproducing machine having a sound box and a swinging gravity actuated support for said sound box adapted to act when the sound box is lifted.

37. A phonograph having a stylus, a controller comprising a sliding controlling plate and a swinging support therefor.

38. A multiple record sound-reproducing or sound-recording machine having means for throwing the stylus in and out of engagement with the record, means for presenting successive records in operative relation to the stylus, and differential means for causing engagement of said stylus with the successive records at the beginning of the record groove and disengagement therefrom at the end of the record groove.

39. A sound-reproducing machine having sound-reproducing mechanism, means for presenting to the said mechanism a succession of records, and differential means for disengaging the sound-reproducing mechanism in each case from the record at the end of the record groove.

40. A sound-reproducing machine having sound reproducing mechanism, means for

presenting to said mechanism a succession of records, and differential means for engaging said mechanism in each case with the record at the beginning of the record groove.

41. A multiple record sound reproducing machine having a plurality of records, each provided with an identifying mark, a mandrel having also an identifying mark where-
by the record may be placed thereon in a predetermined position, a stylus, and means for presenting said records in succession to said stylus, means for lowering the stylus upon the record, and means for simultaneously starting the rotation of the record.

42. A multiple record sound reproducing machine having a plurality of records having each an identifying mark placed for the determination of the beginning of the record groove, means for holding each record against rotation prior to the engagement of the stylus therewith, and means for presenting said records successively to the stylus.

43. A sound reproducing machine employing a grooved record, a traveling sound box provided with a stylus, means for lowering the sound box and stylus at a point determined with reference to the beginning of the record groove, and means for presenting the record for engagement with the stylus in a predetermined position upon its support.

44. A multiple record sound reproducing machine having sound reproducing mechanism, a plurality of records, means for presenting them successively to the action of the sound reproducing mechanism, means for holding each record against rotation prior to its presentation to the sound reproducing mechanism, and means for releasing the same prior to the engagement of the sound reproducing mechanism therewith.

45. A multiple record sound reproducing machine having a stylus, a plurality of records, means for presenting said records successively for engagement with said stylus, and means to cause disengagement of the stylus from the records at variable points in the path of stylus travel.

46. A multiple record sound reproducing

machine having a stylus, a plurality of records, means for presenting said records in succession for engagement with said stylus, and means for causing engagement of the stylus with the successive records at variable points in the path of stylus travel.

47. A multiple record sound reproducing machine having sound reproducing mechanism, a plurality of records, and means for presenting said records in succession for engagement with said sound reproducing mechanism, said mechanism including a stylus having a variable length of travel.

48. A multiple record sound-reproducing machine, having a traveling sound box, means for advancing said sound box, means for holding said sound box in a position to disengage from said advancing means for its return movement, and means for changing the position of said holding means to vary the time of stylus engagement with the different records.

49. A multiple record sound-reproducing machine, having a traveling sound box, means for advancing the said sound box, a controller for holding the said sound box out of engagement with its advancing means during return movement, and means for adjusting said controller to vary the time of engagement with the advancing means for the different records.

50. A multiple record sound reproducing machine employing a stylus and having a stylus controller the application of the stylus to the record by the controller being dependent upon the location on the record of the beginning of the record groove or impression.

51. A multiple record sound reproducing machine having a plurality of records, a stylus, and means for varying in consecutive records and with reference to the character of successive sound records the time of application of the stylus to the record.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

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SOUND RECORDING AND REPRODUCING MACHINE.
APPLICATION FILED FEB. 27, 1905.

995,680.

Patented June 20, 1911.

3 SHEETS—SHEET 1.

Fig. 1

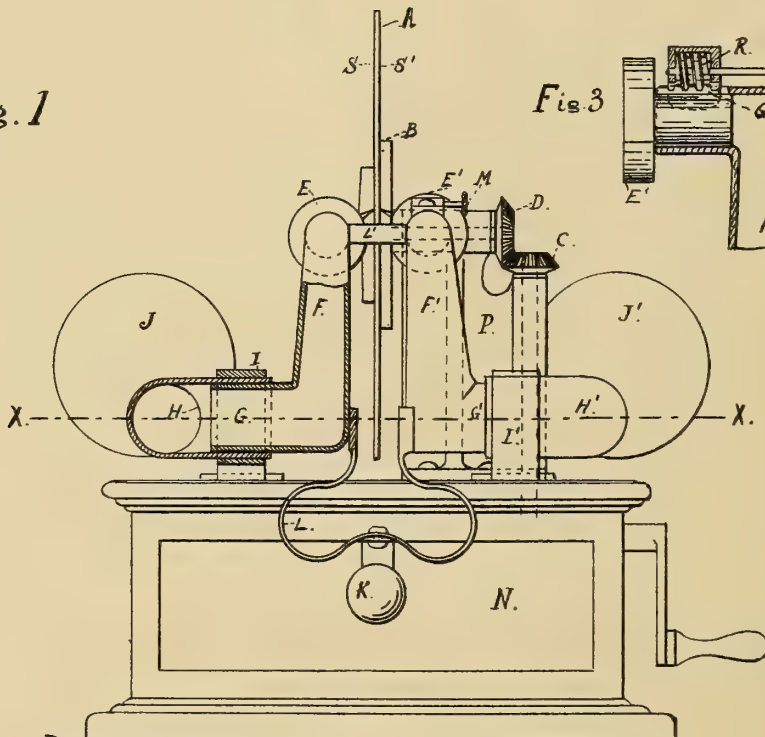


Fig. 3

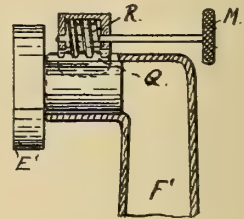
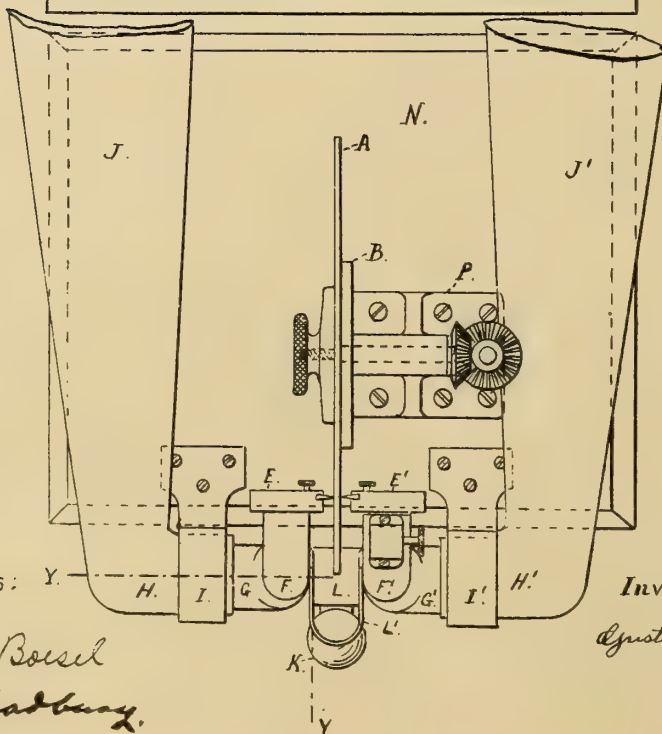


Fig. 2.



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3 SHEETS—SHEET 2.

Fig. 4.

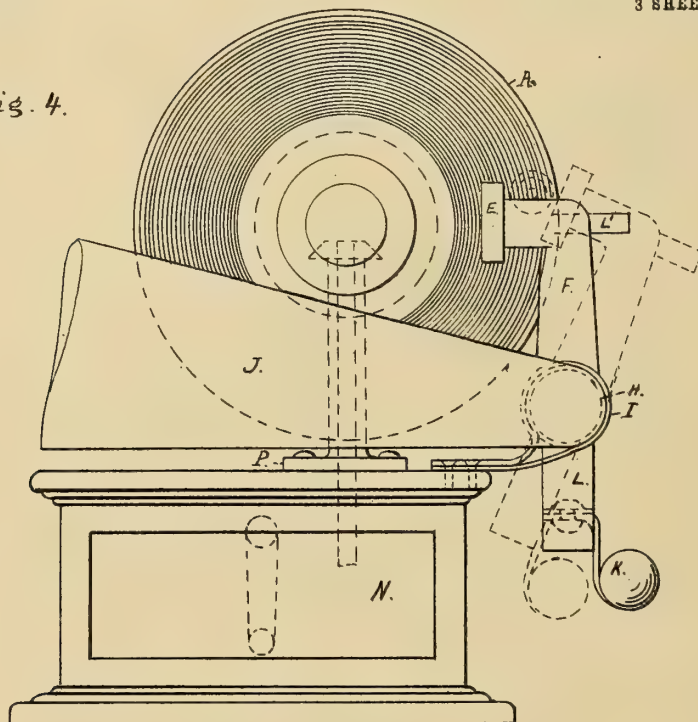
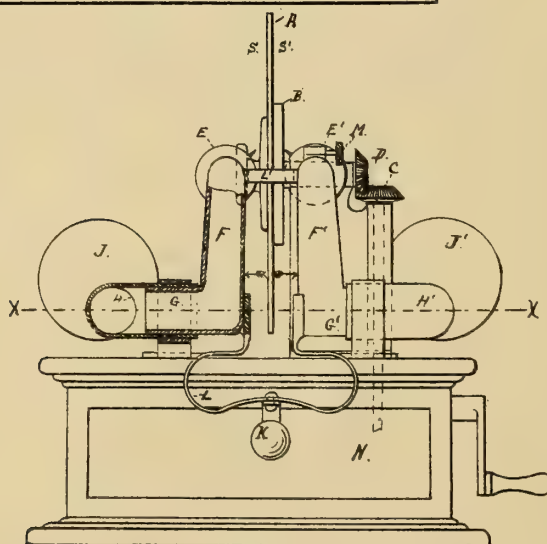


Fig 5.



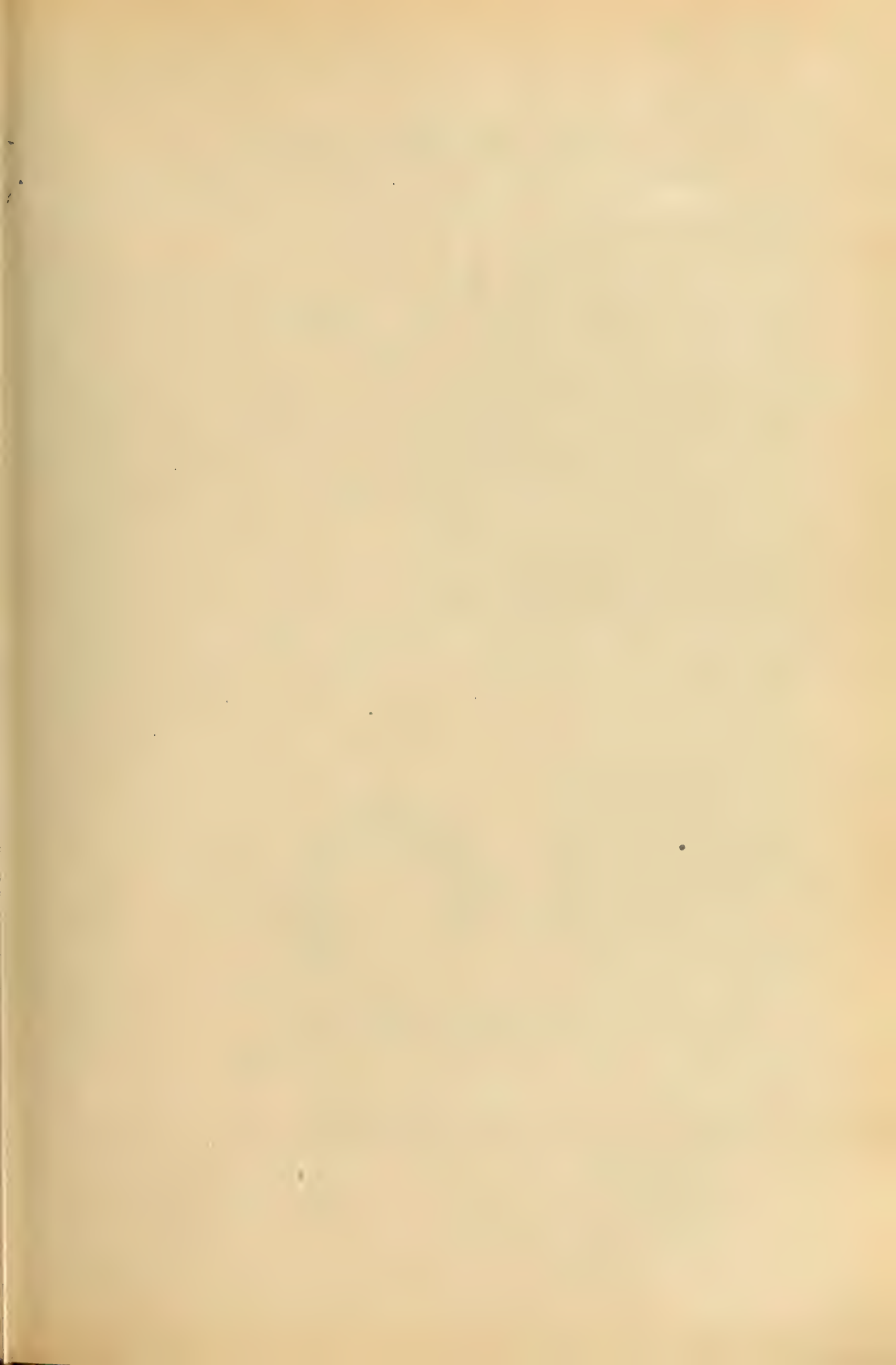
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3 SHEETS—SHEET 3.

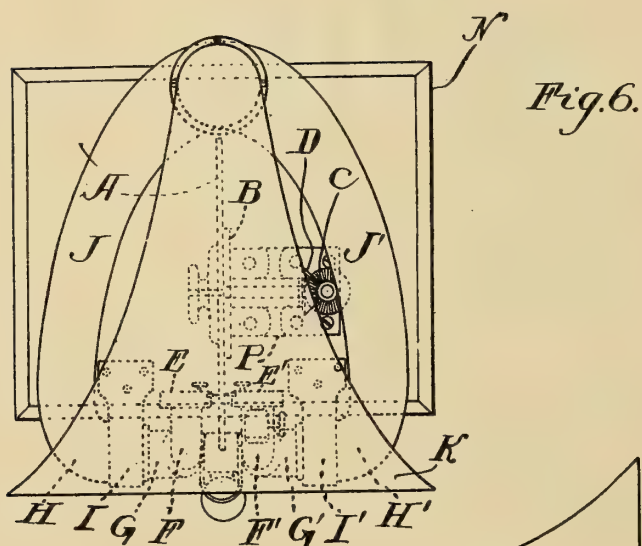


Fig. 6.

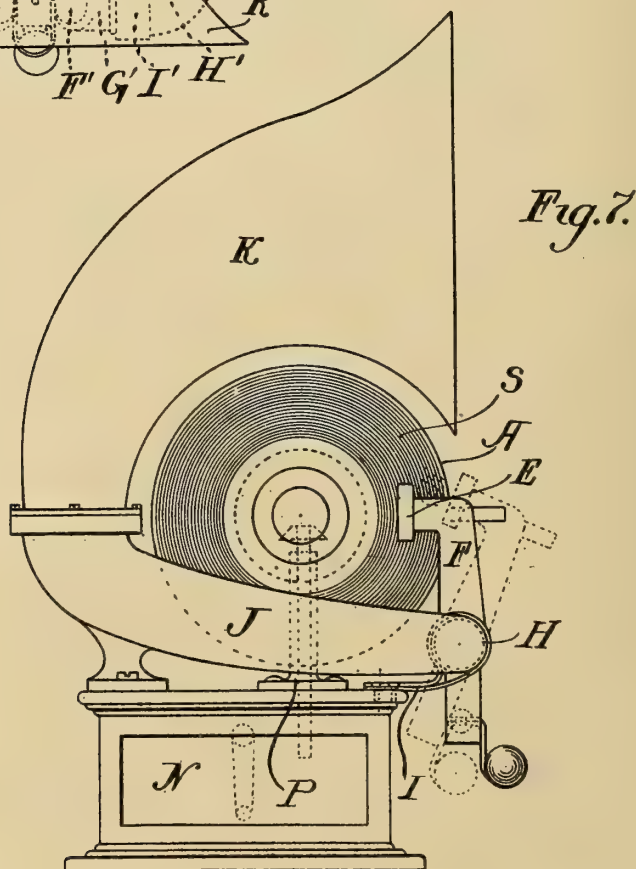


Fig. 7.

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UNITED STATES PATENT OFFICE.

GUSTEN JUNGREN, OF ST. PAUL, MINNESOTA, ASSIGNOR OF TWO-FIFTHS TO
FREDERICK G. BRADBURY, OF ST. PAUL, MINNESOTA.

SOUND RECORDING AND REPRODUCING MACHINE.

995,680.

Specification of Letters Patent. Patented June 20, 1911.

Application filed February 27, 1905. Serial No. 247,625.

To all whom it may concern:

Be it known that I, GUSTEN JUNGREN, a citizen of the United States, residing at St. Paul, Ramsey county, State of Minnesota, have invented a new and useful Sound Recording and Reproducing Machine, of which the following is a specification.

My invention is a sound-recording and reproducing machine, in which a musical composition or other combination of sounds is recorded in plural and unlike or similar parts or portions on plural recording surfaces, one surface for each part. These parts or portions of the record are then reproduced at the same time and together so that the corresponding elements of tone and rhythm in them coincide making the effect like that of the original production.

The object of my invention is to give more volume, clearness and strength to the reproduction of sounds and also to bring out the musical harmonies more fully than can be done by the method now in use of recording the sounds on one surface only.

In the accompanying drawings, Figure 1 is an elevation of my invention, partly in section along the line Y—Y (Fig. 2); Fig. 2 is a top plan, showing the sound conveying tubes partly broken away; Fig. 3 is a section of the upper end of one of the tubular arms, supporting a sound-box; Fig. 4 is a side view of Fig. 1; Fig. 5 is a view similar to Fig. 1, with the sound-boxes spread apart; Fig. 6 is a plan of my invention with a single amplifying horn, and Fig. 7 is a side elevation of the construction illustrated in Fig. 6.

These drawings and the following detailed description relate to a style of my invention wherein only two disk-surfaces are used for the recording and reproducing simultaneously of the musical composition or other combination of sounds selected. The sound waves from the original production are divided into two parts and by means of receiving funnels or horns, conveyed to and simultaneously recorded upon two disk-surfaces, one part on each surface, said surfaces being of the same size and rotating at exactly the same speed, one from left to right, the other from right to left and presenting a material, and other conditions, favorable for and usually employed for the recording of sounds. These two parts or

halves, together constituting the record in

full of the selection are then reproduced at the same time, the corresponding elements of tone and rhythm in them simultaneously, so that the effect will be like the original production. The recording of the two parts of the record may be done upon the surfaces of two separate disks of equal conditions as to size, speed, etc., the two parts, in the duplication of the first record may be transferred later upon the two surfaces of one disk, corresponding convolutions of the spiral sound-grooves and the elements of sound therein exactly opposite each other; or it may be done at once upon the two faces of one disk which will then constitute a master record from which others may be duplicated. The two parts or halves of the record may be made similar or unlike, phonetically, and I do not wish to limit myself to either of these two alternatives but I prefer an arrangement whereby dissimilar parts of the musical composition or other combination of sounds selected are recorded upon the two surfaces. Such an arrangement enables me to bring out the various parts more distinctly and unmixed thus rendering the musical harmonies more clear and like those of an original production. The following is a brief description of such an arrangement: The performers of the sounds to be recorded and reproduced must all perform at once and under the usual conditions for recording sounds upon disk surfaces: only that they are divided into two groups within hearing distance of each other so that the selection may be well rendered as to rhythm, expression, and so forth, but far enough apart so that the sound waves from each of these two groups may be gathered and conveyed, by means of receiving horns, to two disk surfaces, in the spiral sound-grooves of which they are recorded, without being in a great degree commingled with the vibrations from the other part. In the grouping of the performers those producing sounds mostly alike as to pitch, volume, and so forth, should be placed together. In the case of a band of wind instruments or an orchestra, the trebles on one side, and the basses on the other; if a vocal duet, the high voice may be placed and recorded on the one surface, the lower pitched voice on the other, and the accompaniment with the latter, or divided, as its nature may require; if a male quartet the tenors should sing to

gether to the one surface, the basses being recorded upon the other and so forth.

In the accompanying drawings, A represents a disk-record conforming to the above requirements, having upon its surfaces S S', in two parts, a record of a musical selection.

C D are bevel gears transmitting the motion from the motor (not shown) in the cabinet N to the turn-table B, onto which the disk is secured. P is a supporting frame, secured to the top of the cabinet and having journal bearings for the two shafts of said bevel gears.

E E' are two sound-boxes of ordinary construction, having their reproducing-needle-points exactly opposite to each other on the two surfaces S S'.

F F' are two tapering tubular arms receiving and supporting the two sound-boxes and bent at their upper ends at right angles so as to hold the sound-boxes in the proper position to the disk-surfaces. The sound vibrations from the sound-boxes are conveyed through the tubular elbows formed by the attachment of the tubes C C', at right angles to the arms F F', and then through the tubular fittings H H', which are secured to the cabinet by means of the brackets I I', and through the tapering tube J J'; the latter may serve to convey the sound directly to the auditors but I recognize it as a desirable construction to add a swivel amplifying-horn K into the smaller end of which the larger terminals of the tubes J J' then should converge. Such horn is shown in Figs. 6 and 7.

The tubular arms F F', with the tubes C C' firmly joined to them and to sound-boxes at their upper ends, are joined together by means of two springs L L' which, being shaped so as not to interfere with the interposing disk, press the reproducing-needles against the disk-surfaces. By means of these springs the parts E, F, G, L, G', F', and E' move together as one piece, which may either slide right and left in the tubular bearings H H', to compensate for uneven motion in the disk, or swing parallel with the disk as the needle-points move in the spiral sound-grooves upon the disk toward the center, or both. By this means of connecting the tubular arms may be distanced from each other by forcing the springs to spread and thus the adjustment and replacement of reproducing-needles in the sound-boxes is facilitated.

The cycles of the spiral grooves upon the disk-surfaces being very close together, ninety or more of them to an inch, the main difficulty to overcome in my method of sound-reproduction is to get, with certainty, the two reproducing-needle-points to run at the same time in the corresponding convolutions of the spiral grooves upon the two surfaces. This difficulty I overcome in the

following manner: One, or both, of the sound-boxes—for example I will choose E'—is movable, in and out, in its tubular supporting arm F', by means of a rack Q (Fig. 3) having teeth secured thereto and a pinion, or worm R, provided with a milled head M, fastened upon the tubular arm and working in the teeth of said rack Q. When the needles have been replaced the operator holds the sound-boxes close to the edge of the disk, but disengaged therefrom (this position is indicated in Fig. 4 by dotted lines) and looking down upon the points of the reproducing-needles, he turns the milled head M, adjusting the two points as nearly opposite as he is able. As this cannot be deemed sufficient for accuracy, for in making of the record, the corresponding cycles of the sound-grooves may not have been placed exactly opposite each other on the two surfaces, as intended, I have provided the disk-record, hereinbefore partially described, with a signal prefacing the main record, said signal consisting of numerals, letters, syllables, or words constituting a series of numbers, letters, a word, words or a phrase and recorded in quick succession alternatively upon the two disk-surfaces. For illustration I will say that the signal consists of the compound word "all-right". The word "all" is then recorded upon the surface S and the word "right" is recorded upon the surface S'. These words need not be loud, merely sufficient to be heard by the operator. As soon as the reproducing-needles engage the sound-groove of the revolving disk the word "all-right" will be heard provided the needle-points have the proper relation to each other. If the machine calls out "right-all" the operator, being duly instructed as to what the signal should be will understand that the sound-box E' engages the record ahead of its companion sound-box E and that it therefore should be drawn back the width of one sound-groove or more, as indicated by the separateness of the two words, by means of slightly turning the milled head M. Again, should the effect be "all—right" the distancing of the words would indicate that the sound-box E is in advance and hence that E' should be moved in the opposite direction to that in the previous case. By having "one" recorded upon the surface S "two" upon S', "three" upon S, and "four" upon S' in close succession the purpose in view may be still easier attained.

An additional advantage offered by my method of recording and reproducing sounds and adding a new feature to disk-record machines is that the reproduction of the record may be done backward, employing the same mechanism (but for a provision to turn the sound-boxes in their sockets, so as to get the right angle of the needles to the

disk) by reversing the disk upon the turntable and starting the reproducing at the inner, or central, instead of the marginal, ends of the spiral sound-grooves. Records intended to be used in this manner should be provided with a signal, as hereinbefore described, at the close of the record proper, in addition to the marginal signal. The reversing of records will in many instances cause amusing effects and may give musicians the clue to new melodies and harmonies and afford scientists better opportunities to analyze the principles of sound.

For the convenience of the operator all disk-records for the class of machines as set forth may be labeled in a manner to readily distinguish the two faces from each other.

My invention is applicable to sound-recording and reproducing machines, broadly; and while, in producing sounds from a disk-record of the class hereinbefore described, I deem that the vertical position of the disk, as shown, is most advantageous, the method and principle as set forth are also applicable to a horizontal or other position of the disk, with slight adaptation of details in the mechanism. I do not wish, therefore, to be understood as limiting myself to the style and arrangement as shown in the accompanying drawings.

I am not aware of the use, nor invention, prior to mine, of a sound-recording and reproducing machine having plural parts, or portions of the same selection of sounds upon plural recording surfaces, said parts recorded at the same time, and reproduced simultaneously, in such a manner that the corresponding elements in them coincide; or of a double-faced disk-record having phonetically unlike or similar parts of the same sound-record, one upon each surface to be simultaneously reproduced, corresponding elements of sound and rhythm in them coinciding; or any mechanism for reproducing sounds from such disk-records.

What I claim as new, therefore, and desire to secure by Letters Patent, is—

1. A sound recording and reproducing machine, comprising a rotatable record disk, having sound-records upon its opposite faces, and sound boxes having styluses simultaneously engaging said sound-records.

2. A sound recording and reproducing machine, comprising a movable record, having sound-records upon its opposite faces, and sound boxes having styluses simultaneously engaging said sound records.

3. In a machine for reproducing sound, a record operatively exposed on two sides and means for producing sound from said record, comprising a pair of oppositely disposed reproducers adapted to be simultaneously influenced by said record.

4. In combination with a sound record

disk, means for simultaneously subjecting the opposite faces of said disk to sonorous vibrations, for the purposes specified.

5. In a machine for reproducing sound, a flat record operatively exposed on two sides, sound reproducers adapted to simultaneously engage said record on its opposite sides, and means for causing substantially equal pressure by said reproducers against the opposite sides of said record.

6. A machine of the class set forth, comprising a rotatable record disk, having sound-records upon its opposite faces, sound boxes, having styluses simultaneously engaging said sound-records, and means for causing a spiral line to be traced on the faces of said disk by the styluses.

7. In a machine of the class set forth, a disk record provided with sound grooves in each of its opposite faces, said grooves having coinciding and dissimilar phonetic parts, and means for simultaneously reproducing sound from said grooves.

8. In a machine of the class set forth, a disk record provided with sound grooves in its opposite faces, each groove recording a part of a combination of sounds, and means for simultaneously reproducing sound from said grooves.

9. In a machine of the class set forth, a disk record having a pair of sound reproducing grooves in its opposite faces, means for revolving said record in a vertical plane, a pair of styluses tracing in said grooves, and means for adjusting said styluses to register with corresponding phonetic parts in said grooves.

10. In a sound recording and reproducing machine, a sound record provided with opposed sound grooves, sound boxes provided with styluses coacting with said sound grooves to simultaneously reproduce parts of a combination of sounds, and a phonetic signal, recorded in said grooves, indicating the relative positions of said styluses.

11. In a sound recording machine, a record disk and simultaneously operable recorders having points adapted to inscribe sound grooves on the opposite faces of said disk.

12. In a sound recording and reproducing machine, a record disk provided with sound grooves in its opposed faces, sound boxes having points engaging the grooves in said disk, and means for adjusting said points in said sound grooves.

13. In a sound recording and reproducing machine, a record disk provided with sound grooves in its opposed faces, sound boxes having points engaging said sound grooves, and means for independently adjusting said points with relation to said grooves.

14. In a sound recording and reproducing machine, a record disk provided with sound grooves in the opposed faces thereof, sound

boxes having styluses tracing in said sound grooves, means for rotating said disk, and means for adjusting said sound boxes with their points in the sound grooves of said disk.

15. In a machine of the class set forth, a vertical turn table for holding a disk, means for actuating said turn table to turn said disk in a vertical plane, means for detachably holding said disk on said turn table, and sound boxes having styluses tracing upon the opposite faces of said disk.

16. In a machine of the class set forth, a record disk, having sound-records upon its opposite faces, means for rotating said disk in a vertical plane, and sound boxes having styluses simultaneously engaging said sound-records.

17. In a machine of the class set forth, the combination of a record disk, having sound-records upon its opposite faces, means for rotating said disk in a vertical plane, sound boxes, having styluses simultaneously engaging said sound-records, and means for amplifying the sounds reproduced by said boxes.

18. In a machine of the class set forth, the combination of a disk adapted to receive sound-records upon its opposite faces, means for rotating said disk in a vertical plane, sound boxes, having cutting tools simultaneously engaging the opposite faces of said disk, and means for conveying sound to said boxes.

19. A machine of the class set forth, comprising a movable record, having plural sound-records pertaining to the same phonetic composition, arranged to operate together and provided with a phonetic signal, and sound boxes having styluses simultaneously engaging said sound-records.

20. A sound record tablet provided with right and left hand spiral sound grooves and means for simultaneously reproducing sound from said grooves.

21. In a machine of the class set forth, a sound record tablet and means for simultaneously inscribing right and left hand sound grooves in said tablet.

22. In a machine of the class set forth, a sound record tablet and means for simultaneously inscribing right and left hand sound grooves in the opposite faces of said tablet.

23. In a machine for reproducing sound, a record tablet operatively exposed on two sides, sound reproducers adapted to simultaneously engage said record on its opposite sides, and resilient means for holding said

reproducers under equal pressure against the opposite sides of said tablet.

24. In a machine of the class set forth, a sound record tablet provided with right and left hand spiral sound grooves in its opposite faces, said grooves including a phonetic signal preceding the main part of the record, and means for simultaneously reproducing sound from said grooves.

25. In a sound reproducing apparatus, a traveling tablet having a sound record formed on each side thereof, a reproducing stylus shaped for engagement with one of said records and free to be vibrated and propelled by the same, and a reproducing stylus shaped for engagement with the other record and free to be vibrated and propelled by the same.

26. In a machine of the class set forth, a rotatable record disk, having sound records upon its opposite faces, sound reproducers simultaneously engaging said records to simultaneously reproduce from the records upon the opposite sides of said disk and a common amplifying horn connected with said reproducers.

27. In a sound reproducing apparatus, a traveling tablet having a sound record formed on each side thereof, a sound box having a reproducing stylus shaped for engagement with one of said records and free to be vibrated and propelled by the same, a second sound box having a reproducing stylus shaped for engagement with the other record and free to be vibrated and propelled by the same, and an amplifying horn in which said sound boxes have a common outlet.

28. A sound reproducing machine, including a double faced disk record tablet having sound records upon its opposite faces and sound reproducers simultaneously engaging said records to simultaneously reproduce from the records upon the opposite sides of said disk.

29. A sound reproducing machine, including a double faced disk record tablet having sound grooves upon its opposite faces and means for simultaneously reproducing from the records upon the opposite sides of said disk.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GUSTEN JUNGREN.

Witnesses:

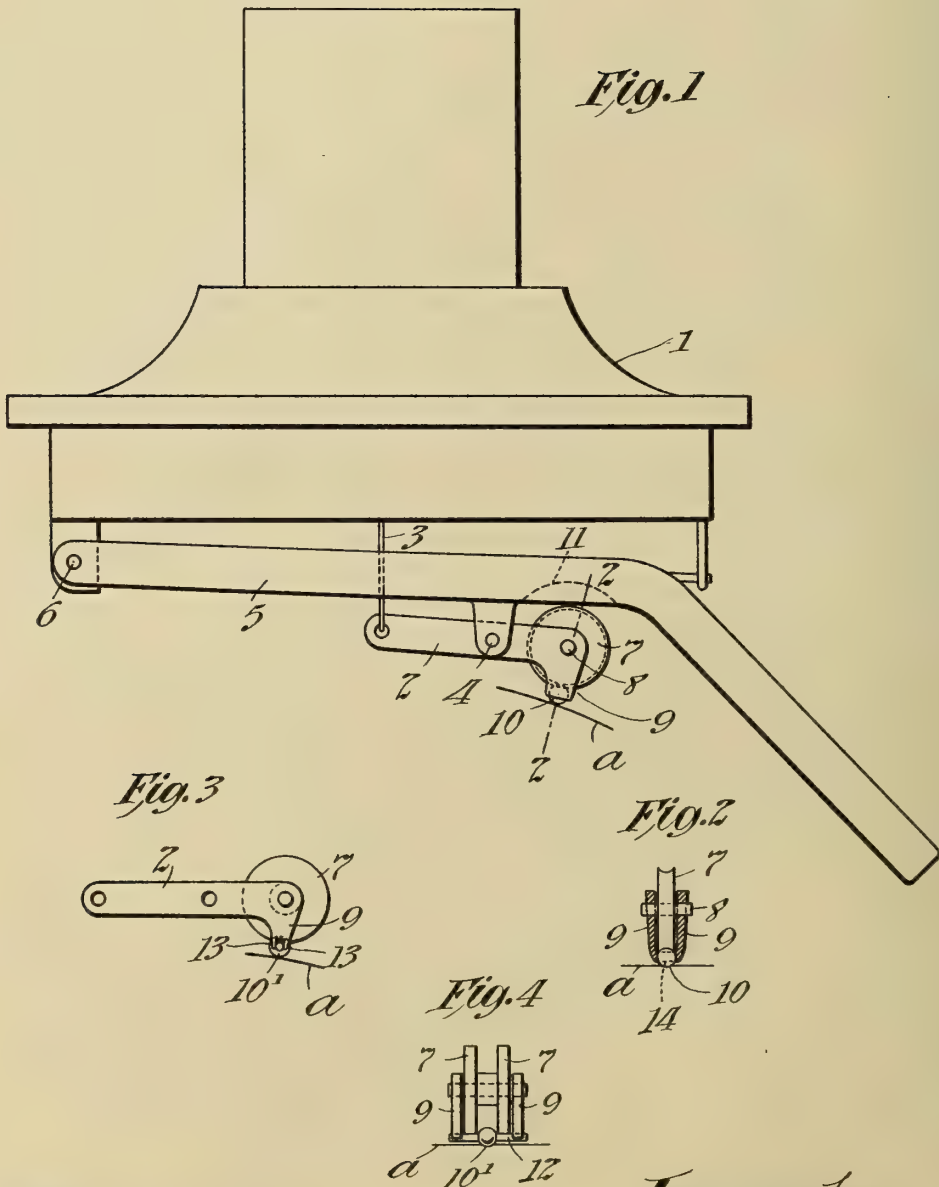
ELSIE M. BOESEL,
F. G. BRADBURY.

976.125

T. A. EDISON.
 PHONOGRAPH REPRODUCER.
 APPLICATION FILED MAR. 18, 1908.

996,625.

Patented July 4, 1911.



Witnesses:
 Frank D. Lewis
 Herbert H. Dyke

Inventor:
 Thomas A. Edison
 by Frank L. Ryan
 Atty.

UNITED STATES PATENT OFFICE

THOMAS A. EDISON, OF LLEWELLYN PARK, ORANGE, NEW JERSEY, ASSIGNOR TO NEW JERSEY PATENT COMPANY, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

PHONOGRAPH-REPRODUCER.

996,625.

Specification of Letters Patent.

Patented July 4, 1911.

Application filed March 18, 1908. Serial No. 421,888.

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, and a resident of Llewellyn Park, Orange, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Phonograph-Reproducers, of which the following is a description.

Phonograph reproducers as now generally used, comprise a stylus having a curved surface adapted to be applied to the record groove with a suitable degree of pressure, and as the record surface travels said stylus slides along the surface of the groove and moves toward and away from the body of the record.

My invention has for its object the elimination of the friction which is caused by the sliding of the stylus over the record surface by providing a stylus in the form of a roller or ball, and rotatably supporting the same, so that it presses upon and rolls along the record surface.

My invention has for its further object the provision of a support for the said stylus, which enables it to rotate with a minimum amount of friction.

Referring to the accompanying drawing, Figure 1 is a side elevation of a phonograph reproducer constructed in accordance with my invention; Fig. 2 is a detail section on line 2-2 of Fig. 1; Fig. 3 is a side elevation of a stylus lever carrying a modified form of rotary stylus, and Fig. 4 is an end view of the same.

The reproducer shown comprises the sound box body 1, which carries a diaphragm connected to the stylus lever 2 by the link 3, said lever being pivoted at 4 to the floating weight 5, which is pivotally supported at 6, said parts being of well-known form and construction. At the end of the lever 2, opposite the link 3, is mounted a roller 7, which turns on the pin 8 and is provided with a grooved periphery, as shown in Fig. 2. The lever 2 is recessed to receive said roller 7 and provided with a pair of downwardly extending arms 9, con-

nected by an integral web 14, formed with an opening through which the lower part of the stylus 10 extends, in order to engage the record surface *a*, said stylus being supported by the walls of said opening so that it cannot drop out of the opening when unsupported by the record surface. The stylus 10 is preferably of spherical form and may be of sapphire, metal or other suitable material, the curvature of the stylus being the same as that of the peripheral groove of the roller 7. The stylus is loose with respect to the lever 2, so that when the stylus rests upon the record surface it is pressed into frictional engagement with the periphery of the roller 7, and the latter therefore forms a rotary abutment or support for the stylus, whereby friction of the same against rotation is reduced to a minimum. The floating weight 5 receives its support from the record surface through the stylus 10, roller 7 and pin 8. The lower surface of the weight 5 is recessed as shown at 11, to permit a vertical movement of the roller 7.

In the device of Figs. 3 and 4, the stylus 10' is in the form of a ball having turnions 12, the ends of which are retained by the fingers 13 formed in the ends of the arms 9 of the lever 2, and said ball rests upon the record surface *a*, and is pressed against the periphery of the roller 7 in the same manner as the stylus of Figs. 1 and 2. The rotary stylus and rotary abutment may, if desired, be suitably mounted for operating upon a record in the form of a disk having a laterally undulating record groove.

Having now described my invention, what I claim is:

1. In a phonograph reproducer, the combination of the floating weight, stylus lever pivoted thereto, a grooved roller carried by said lever, and a spherical stylus engaging the periphery of said roller, substantially as set forth.

2. In a phonograph reproducer, the combination of the floating weight, stylus lever, roller 7 and spherical stylus 10, the periphery of said roller being grooved, and said

stylus being held in engagement therewith by the pressure of the stylus upon the record surface, due to the floating weight, substantially as set forth.

5 3. In a phonograph reproducer, the combination of the floating weight, stylus lever pivoted thereto, a grooved roller carried by said lever, and a rotatable curved stylus en-

gaging the periphery of said roller, substantially as set forth.

This specification signed and witnessed this 13th day of March 1908.

THOS. A. EDISON.

Witnesses:

FRANK L. DYER,

ANNA R. KLEHM.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

996,816.

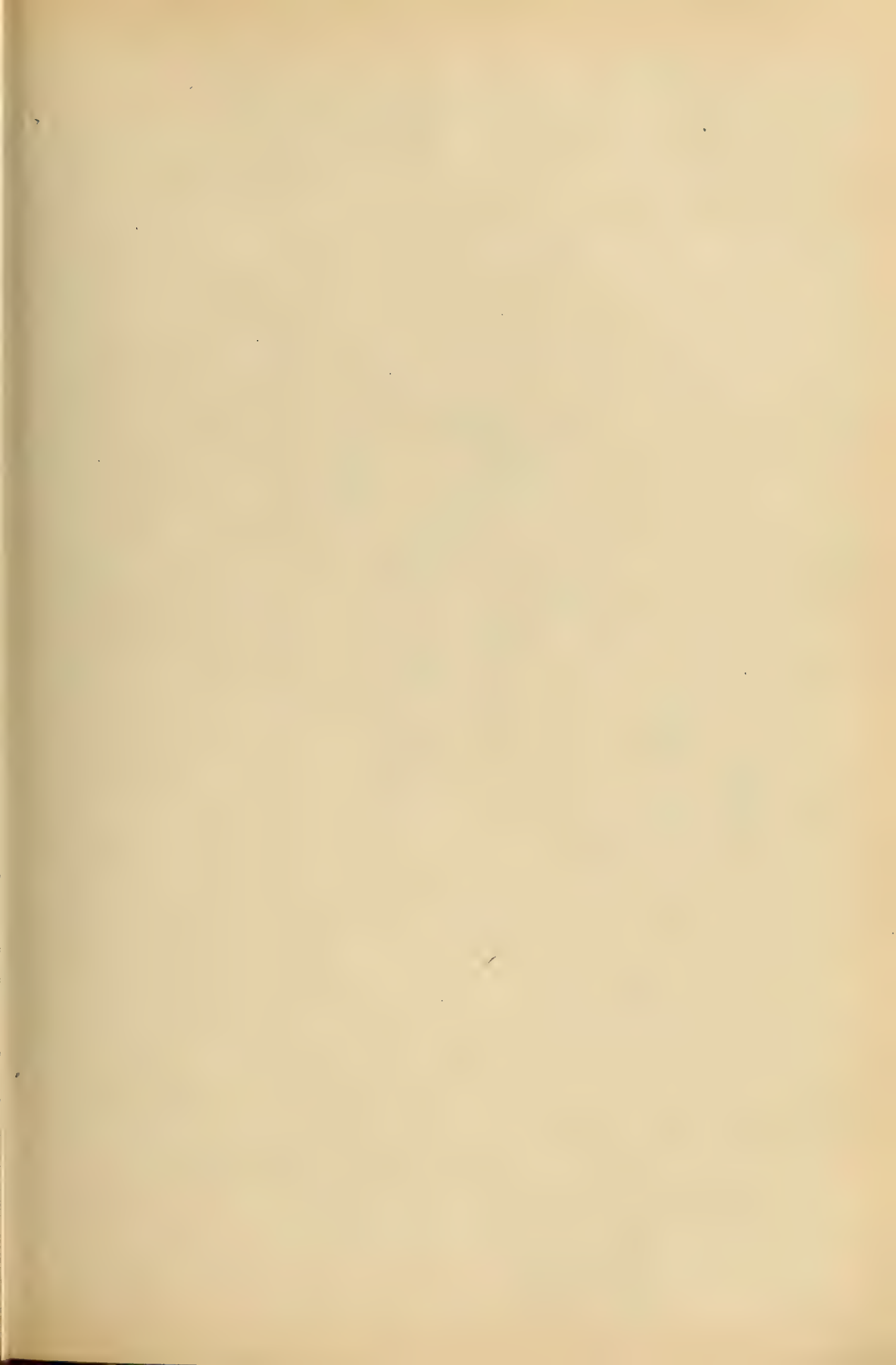
3 SHEETS—SHEET 1.



Witnesses
Ernest Thacker
L. N. Gillis

Inventor
Robert W. Weatherman.

By *Charles C. Chandler* Attorney &

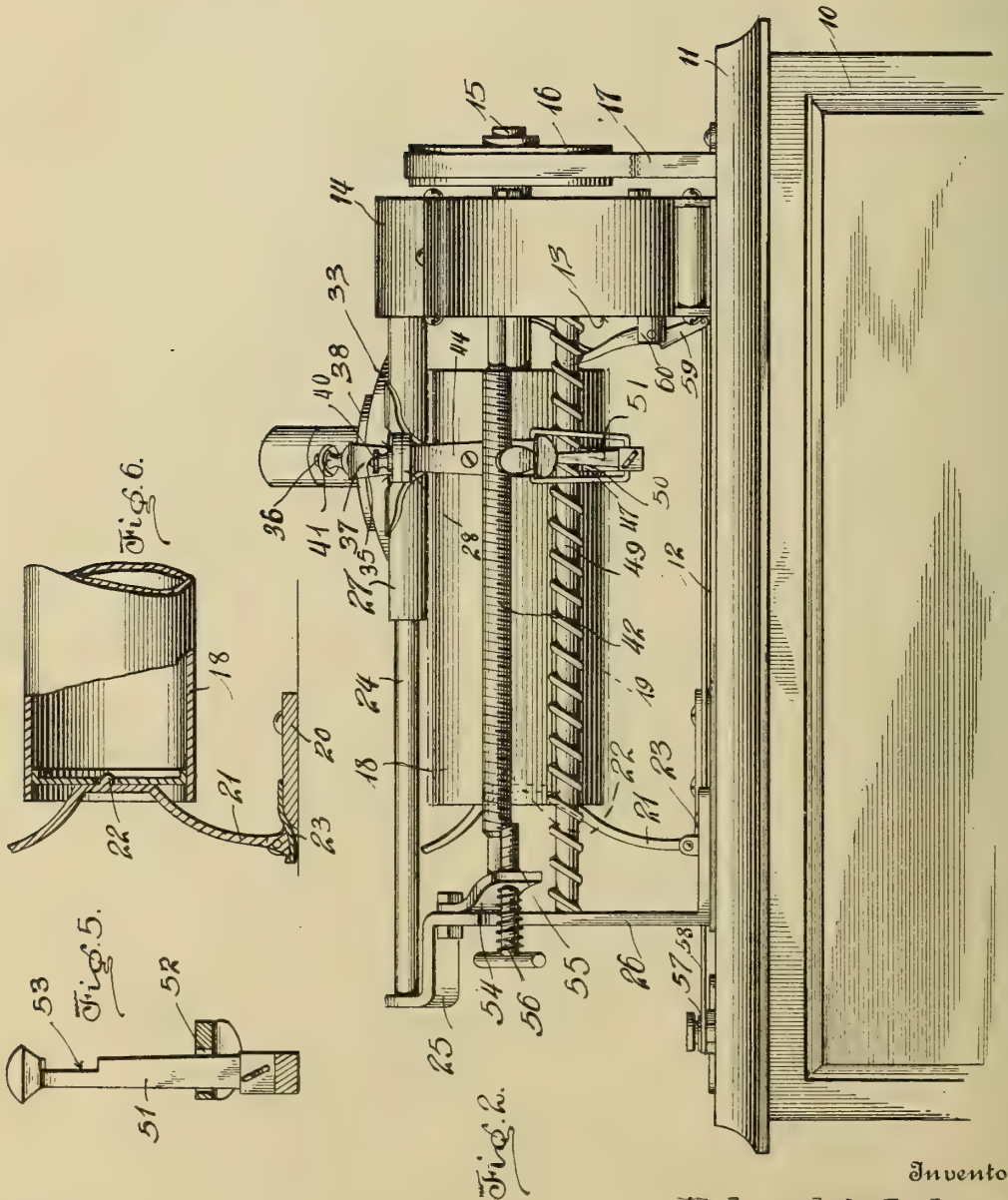


R. W. WEATHERMAN.
SOUND REPRODUCING INSTRUMENT.
APPLICATION FILED AUG. 19, 1910.

996,816.

Patented July 4, 1911.

3 SHEETS-SHEET 2.



Inventor

Robert W. Weatherman

By

Charles C. Weatherman

Attorneys

Witnesses

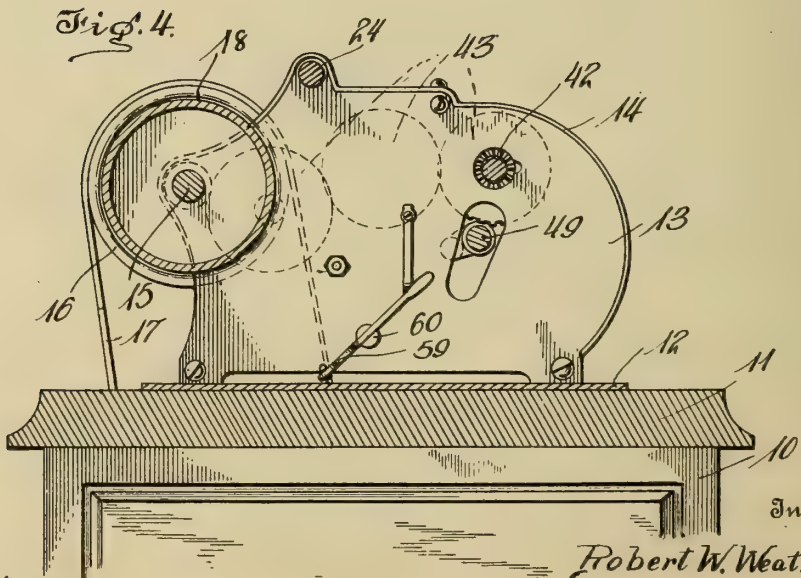
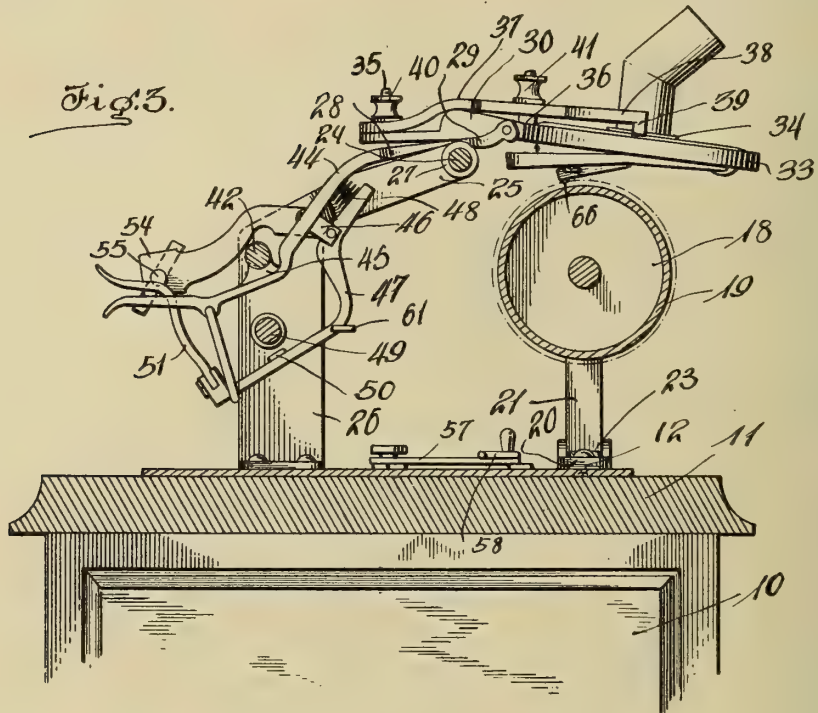
Ernest Hocken
L. N. Gullis

R. W. WEATHERMAN.
SOUND REPRODUCING INSTRUMENT.
APPLICATION FILED AUG. 19, 1910.

996,816.

Patented July 4, 1911.

3 SHEETS—SHEET 3.



Witnesses
Ernest Rocker
A. N. Gillis

Inventor
Robert W. Weatherman
By *Charles C. Randall*
Attorney

UNITED STATES PATENT OFFICE.

ROBERT W. WEATHERMAN, OF SELMORE, MISSOURI, ASSIGNOR OF ONE-HALF TO
FLOYD HARTLEY, OF SELMORE, MISSOURI.

SOUND-REPRODUCING INSTRUMENT.

996,816.

Specification of Letters Patent.

Patented July 4, 1911.

Application filed August 19, 1910. Serial No. 578,016.

To all whom it may concern:

Be it known that I, ROBERT W. WEATHERMAN, a citizen of the United States, residing at Selmore, in the county of Christian, State of Missouri, have invented certain new and useful Improvements in Sound-Reproducing Instruments; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to sound reproducing instruments and has special reference to a mechanism used in connection with machines of the cylinder type to replace the stylus of the reproducer at the beginning of the record after the same has been played.

The principal object of the invention is to improve and simplify the general construction of devices of this character.

A second object of the invention is to provide a means of novel character for stopping the machine after the stylus has been moved back to the starting point.

A third object of the invention is to provide a novel form of holder for the reproducer especially adapted to be used with an instrument of this character.

With the above and other objects in view, the invention consists in general of a sound reproducing instrument of the class described, provided with a novel and improved form of mechanism for moving the stylus back to the starting point after a cylinder has been played, said mechanism actuating an improved reproducer arm.

The invention further consists in certain novel details of construction and combinations of parts hereinafter fully described, illustrated in the accompanying drawings, and specifically set forth in the claims.

In the accompanying drawings, like characters of reference indicate like parts in the several views, and:—Figure 1 is a plan view of a phonograph constructed and equipped in accordance with this invention. Fig. 2 is a rear elevation thereof. Fig. 3 is a section on the line 3—3 of Fig. 1. Fig. 4 is a section on the line 4—4 of Fig. 1. Fig. 5 is a detail view of a certain throw off device used in connection with this instrument. Fig. 6 is a partial section on the line 6—6 of Fig. 1.

The numeral 10 indicates a portion of the

motor box or casing and this casing contains an electric motor of suitable type, the same not being deemed necessary here to be shown as it forms no specific part of the invention. The casing is provided with the usual top 11 whereto is attached a base plate 12. Secured to the base plate adjacent one end is a pair of spaced standards 13 the space between the standards being closed in on the top and sides by a cover 14. The space thus inclosed forms the gear box for the device. Journaled in the standards 13 is a shaft 15 on one end of which is a belt wheel 16 over which runs the belt 17, this belt passing downward into the casing 10 and being driven by a suitable pulley on the motor in the usual manner. The other end of the shaft 15 is provided with the usual mandrel 18 whereon may be held the cylindrical record 19. Secured to the base 12 is a bearing block 20 whereto is pivoted the lower end of an arm 21 provided with a centering projection 22 which engages in an opening in the end of the mandrel to hold the same in proper position while the machine is in operation. This arm 21 is held in either the raised or lowered position by a suitable spring 23.

Fixed to one of the standards 13 and extending out in parallel relation to the shaft 15 is a rod 24. The outer end of this rod 24 is secured to an arm 25 which projects from a standard 26 firmly fixed to the base 12. Slidable on the rod 24 is a sleeve 27 comprising a pair of spaced sections which are connected together by a yoke 28 extending backward from the adjacent ends of the sections. Extending forward from the ends of the yoke arms is a pair of spaced arms 29 between which is pivoted the reproducer arm 30 carrying on its forward end a ring 33 wherein is held a reproducer 34. Fixed to the bight of the yoke 28 is a screw 35 which passes through the rear end of the reproducer arm. At the rear of the ring 33 there is provided a second screw 36 which is firmly fixed to the ring. Held upon the screws 35 and 36 is a locking bar 37 having a forked end 38, the arms of the fork being provided with downwardly turned extremities 39 which bear against the top of the reproducer. The screw 35 carries a thumb nut 40 which serves to adjust the position of the reproducer with reference to the yoke

and also to hold the rear end of the arm 37. On the screw 36 is a thumb nut 41 which serves to hold the front end of the arm 37 in such manner that the projections 39 bear 5 firmly on the reproducer when the latter is in position. Extending from what may be termed the inner standard 13 to the standard 26 is a feed screw 42 of the ordinary type employed in machines of this character and 10 this feed screw is geared to the shaft 15 by a train of gears 43. Extending rearwardly beneath the shaft 42 is an arm 44 which is preferably integral with and projects downward and rearward from the yoke 28. On 15 the upper side of this arm 44 there is provided a segmental nut 45 which is adapted to engage the screw 42 when the rear end of the arm is raised. The weight of the reproducer and parts forward of the rod 24 is such that the normal tendency of the rear 20 end of the arm 44 is to lift and hold the nut in position on the screw.

At 46 is a forked lug between the arms of which is pivoted a lever 47. Between the 25 forward extremity of this lever and the arm 44 is a coil spring 48. This arm 47 extends beneath a screw 49 of extremely coarse pitch which is geared to the last gear of the train 43 so that the two shafts 42 and 49 revolve 30 in opposite directions. On the upper side of the arm 47 is a lug 50 which is arranged to be engaged by the coarse thread of the screw 49. In order to hold the lug out of engagement with said screw during the 35 progress of the segmental nut 45 along the screw 42 the arm 47 has pivoted thereto a latch 51, the upper end of which projects through an opening 52 formed in the rear end of the arm 44 and this latch is provided 40 with a notch 53 which is adapted to engage the edge of the opening 52 so that the rear ends of the arms 44 and 47 may be held apart against the action of the spring 48.

Projecting rearwardly from the standard 45 26 is an arm 54 wherethrough extends a thumb screw 55 the extremity of which lies in the path of the upper end of the latch 51. This thumb screw has surrounding its stem between its head and the arm 54 a 50 spring 56 which acts as a lock spring to prevent accidental movement of said screw. Now, in the operation of this portion of the device when the machine is started the reproducer will travel toward the left of Fig. 55 2 until the latch strikes the screw 55. When the latch thus strikes said screw the notch will be released from its engagement with the arm 44 and the spring 48 will force the arm 47 upward at its rear end until the lug 60 50 contacts with the screw 49. The arrangement of the parts is such that the spring 48 is of sufficient strength to continue this movement by forcing the rear end of the arm 44 downward and thus releasing 65 the nut 45 from the screw 42. This will

cause the stylus of the reproducer to rise from the record and the screw 49 will move said reproducer rapidly toward the right.

In order to stop the machine when the reproducer has been returned to the starting 70 point there is provided a switch 57 which controls the current to the motor. This switch is connected by a link 58 with a lever 59 pivoted to a lug 60 mounted on the inner standard 13. The other end of this lever 75 lies in the path of an arm 61 which projects from the arm 47, the lever end lying in said path when said arm 47 is raised to engage the screw 49. The arrangement is such that as the reproducer is moved back to the starting 80 point by the screw 49 the engagement of the arm 61 and lever 59 will open the switch 57 and thus throw the current off the motor so that the latter can stop. When it is desired to restart the instrument the arm 47 is 85 depressed by means of the latch 51 and the latter engaged with the arm 44 as previously described. This will leave the end of the lever 59 free to be moved in such position that the switch will be closed and the motor 90 started.

The operation of the different parts of the device having been described it is merely necessary to say that the cylinder is placed upon the mandrel in the ordinary way and 95 the reproducer allowed to rest upon the cylinder by moving the latch to such position that the nut 45 engages with the screw 42. The switch is then closed and the machine started. Upon arriving at the end of its 100 travel the latch will be disengaged, the reproducer returned to the starting point and the machine stopped.

There has thus been provided a simple and efficient device of the kind described and 105 for the purpose specified.

Having thus described the invention, what is claimed as new, is:—

1. In a device of the kind described, a guide rod, a sleeve mounted on said guide 110 rod, a feed screw, means to actuate said feed screw, an arm projecting from said sleeve transverse of said feed screw, a segmental nut carried by said arm and adapted to engage said feed screw, a second arm pivoted 115 to the first mentioned arm, a lug adjacent one end of said second arm, a return screw geared to said feed screw and adapted to engage said lug, releasable latch means to hold the lug carrying end of the second arm 120 away from the first arm, means to release said latch when the sleeve has moved to a predetermined point on the rod, and means constantly urging the lug carrying end of the second arm toward the first arm. 125

2. In a device of the kind described, a guide rod, a sleeve mounted on said guide rod, a feed screw, a return screw, means to actuate said feed and return screws, an arm projecting from said sleeve and extending 130

beneath said feed screw, a segmental nut on the upper side of said arm adapted for engagement with the feed screw when the arm is raised, a second arm pivoted intermediate its ends beneath the first arm, said second arm having one end projecting beneath the return screw, a lug on said second arm engageable with the return screw, a spring between said arms adapted to force said second arm against said return screw and thereby depress the first arm, a releasable latch to hold said second arm away from said return screw, and means to release said latch when the sleeve has moved to a predetermined point on said rod.

3. In a device of the kind described, a guide rod, a sleeve mounted on said guide rod, a feed screw, a return screw, means to actuate said feed and return screws, an arm projecting from said sleeve and extending beneath said feed screw, a segmental nut on the upper side of said arm adapted for engagement with the feed screw when the arm is raised, a second arm pivoted intermediate its ends beneath the first arm, said second arm having one end projecting beneath the return screw, a lug on said second arm engageable with the return screw, a spring between said arms adapted to force said second arm against said return screw and thereby depress the first arm, a latch pivoted to the second arm and having a notch engaging the first arm to hold said second arm from actuation by said spring, and means to release said latch when said sleeve has moved to a predetermined point on said rod.

4. In a device of the kind described, a guide rod, a sleeve mounted on said guide rod, a feed screw, a return screw, means to actuate said feed and return screws, an arm projecting from said sleeve and extending beneath said feed screw, a segmental nut on the upper side of said arm adapted for engagement with the feed screw when the arm is raised, a second arm pivoted intermediate its ends beneath the first arm, said second arm having one end projecting beneath the return screw, a lug on said second arm engageable with the return screw, a spring between said arms adapted to force said second arm against said return screw and thereby depress the first arm, a latch pivoted to the second arm and having a notch engaging the first arm to hold said second arm from actuation by said spring, a pair of spaced standards supporting said screws, and a thumb screw carried by one of said standards and lying in the path of said latch when the latter is engaged with the first arm.

5. In a device of the kind described, a guide rod, a sleeve mounted on said guide rod, a feed screw, means to actuate said feed screw, an arm projecting from said sleeve transverse of said feed screw, a segmental nut carried by said arm and adapted to en-

gage said feed screw, a second arm pivoted to the first mentioned arm, a lug adjacent one end of said second arm, a return screw geared to said feed screw and adapted to engage said lug, releasable latch means to hold the lug carrying end of the second arm away from the first arm, means to release said latch when the sleeve has moved to a predetermined point on the rod, and means constantly urging the lug carrying end of the second arm toward the first arm; in combination with a switch actuating mechanism lying in the path of the lug carrying arm when the latter is engaged with the return screw.

6. In a device of the kind described, a guide rod, a sleeve mounted on said guide rod, a feed screw, a return screw, means to actuate said feed and return screws, an arm projecting from said sleeve and extending beneath said feed screw, a segmental nut on the upper side of said arm adapted for engagement with the feed screw when the arm is raised, a second arm pivoted intermediate its ends beneath the first arm, said second arm having one end projecting beneath the return screw, a lug on said second arm engageable with the return screw, a spring between said arms adapted to force said second arm against said return screw and thereby depress the first arm, a releasable latch to hold said second arm away from said return screw, and means to release said latch when the sleeve has moved to a predetermined point on said rod; in combination with a switch actuating mechanism lying in the path of the lug carrying arm when the latter is engaged with the return screw.

7. In a device of the kind described, a guide rod, a sleeve mounted on said guide rod, a feed screw, a return screw, means to actuate said feed and return screws, an arm projecting from said sleeve and extending beneath said feed screw, a segmental nut on the upper side of said arm adapted for engagement with the feed screw when the arm is raised, a second arm pivoted intermediate its ends beneath the first arm, said second arm having one end projecting beneath the return screw, a lug on said second arm engageable with the return screw, a spring between said arms adapted to force said second arm against said return screw and thereby depress the first arm, a latch pivoted to the second arm and having a notch engaging the first arm to hold said second arm from actuation by said spring, and means to release said latch when said sleeve has moved to a predetermined point on said rod; in combination with a switch actuating mechanism lying in the path of the lug carrying arm when the latter is engaged with the return screw.

8. In a device of the kind described, a

guide rod, a sleeve mounted on said guide
rod, a feed screw, a return screw, means to
actuate said feed and return screws, an arm
projecting from said sleeve and extending
5 beneath said feed screw, a segmental nut on
the upper side of said arm adapted for en-
gagement with the feed screw when the arm
is raised, a second arm pivoted intermediate
its ends beneath the first arm, said second
10 arm having one end projecting beneath the
return screw, a lug on said second arm en-
gageable with the return screw, a spring be-
tween said arms adapted to force said sec-
ond arm against said return screw and
15 thereby depress the first arm, a latch piv-
oted to the second arm and having a notch

engaging the first arm to hold said second
arm from actuation by said spring, a pair
of spaced standards supporting said screws,
and a thumb screw carried by one of said 20
standards and lying in the path of said latch
when the latter is engaged with the first
arm, in combination with a switch actuating
mechanism lying in the path of the lug car-
rying arm when the latter is engaged with 25
the return screw.

In testimony whereof, I affix my signa-
ture, in presence of two witnesses.

ROBERT W. WEATHERMAN.

Witnesses:

FLOYD HARTLEY,
T. J. HANKS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,
Washington, D. C."

R. A. BOSWELL.

AMPLIFYING TUBE.

APPLICATION FILED SEPT. 26, 1910.

997,265.

Patented July 11, 1911.

2 SHEETS-SHEET 1.

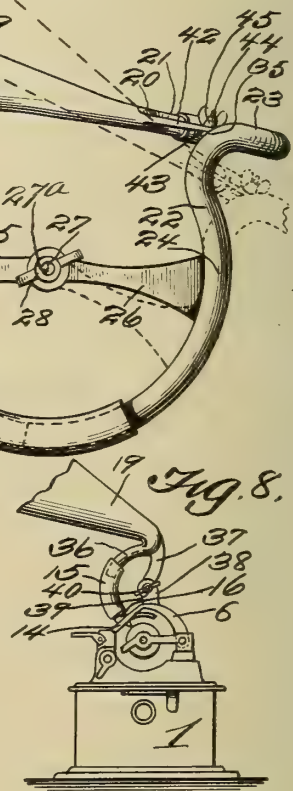
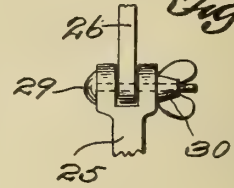
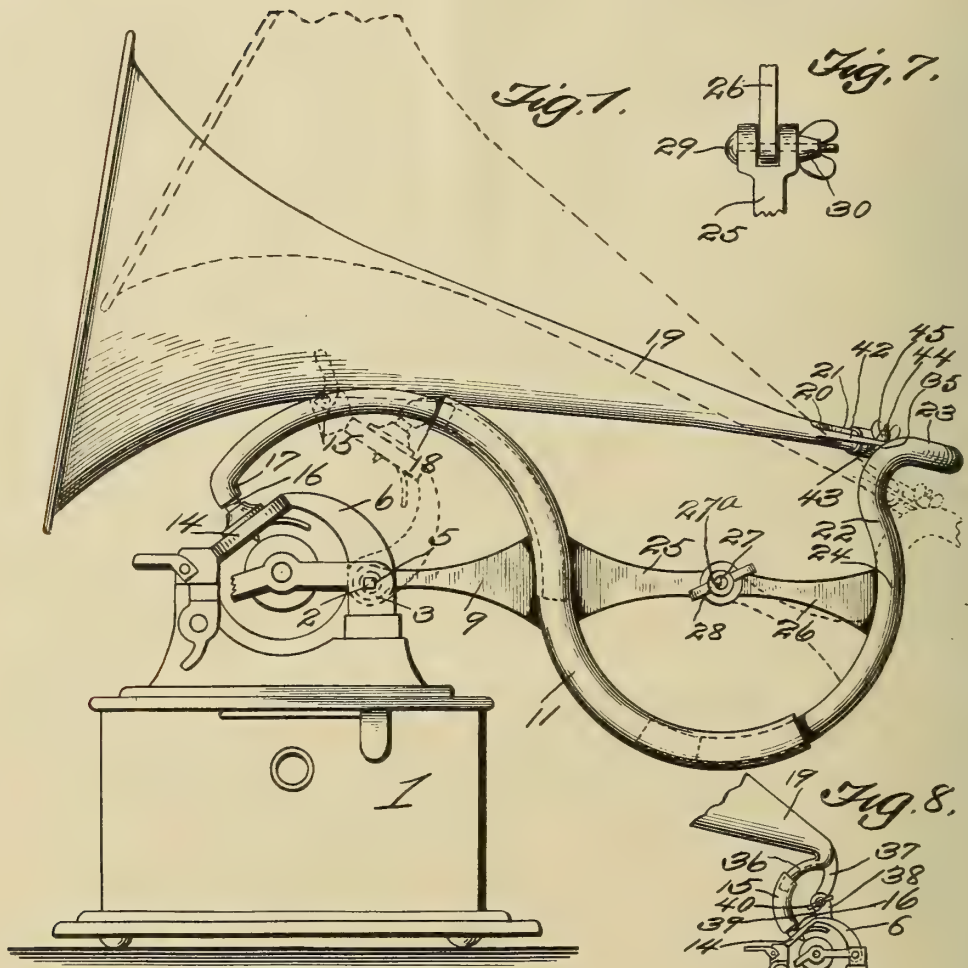


Fig. 2.

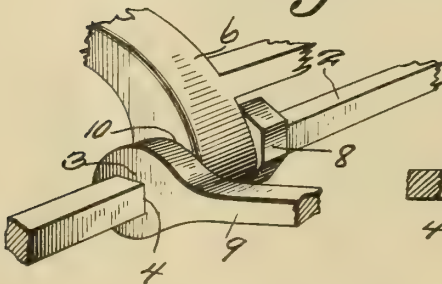
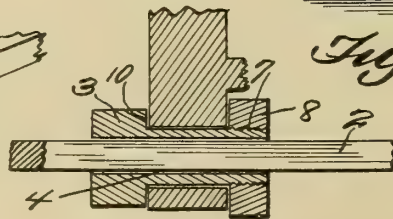


Fig. 3.



Witnesses

Charles S. Ford.
A. Cole

Inventor

Rob. A. Boswell.

By R. A. Boswell & Co.
his Attorneys

997,265.

Patented July 11, 1911.

2 SHEETS—SHEET 2.

Fig. 4.

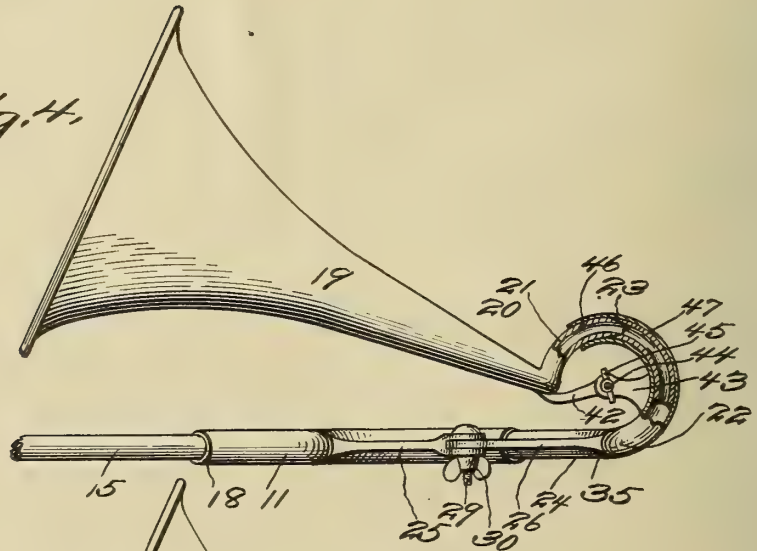


Fig. 6.



Fig. 5.

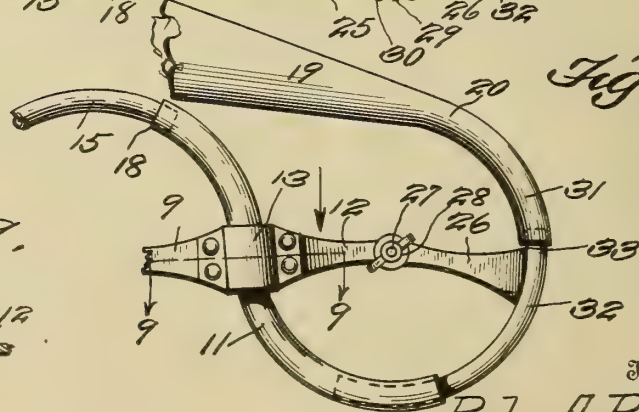


Fig. 9.



Witnesses

Edward S. Ford,
 K. Cole

Inventor

Rob. A. Boswell.

By *Rob. A. Boswell*
 his *Rob. A. Boswell* Attorneys

UNITED STATES PATENT OFFICE.

ROBERT A. BOSWELL, OF WASHINGTON, DISTRICT OF COLUMBIA.

AMPLIFYING-TUBE.

997,265.

Specification of Letters Patent.

Patented July 11, 1911.

Application filed September 26, 1910. Serial No. 583,704.

To all whom it may concern:

Be it known that ROBERT A. BOSWELL, a citizen of the United States of America, residing at Washington city, District of Columbia, has invented a new and useful Amplifying-Tube, of which the following is a specification.

This invention is classified in the art of acoustics, and it essentially pertains to a new and useful amplifying tube or horn, adapted for use upon a talking machine of a type which is generally known as the cylinder machine.

In machines of the cylinder type, prior to this invention, the bell portion of the majority of the amplifying tubes is pivotally supported, while the smaller portion of the tube has a pivotal or swiveled connection with the reproducer in such wise as to allow the amplifying tube or horn to oscillate, as the reproducer is fed along the record. This structure of machine, it has been held, in some respects, is un-symmetrical, awkward and clumsy, and, the basic purpose of this invention is to eliminate these objectionable features, and furthermore, to improve the structural details of the amplifier. By improving such structural details, the sound, to some extent, is increased, because of the lengthy travel (which has been increased beyond that heretofore utilized) of the volume of sound through the amplifier (the greater portion of which is restricted to a very small diameter in cross section). The volume of sound, when passing through this restricted portion of the amplifier, is held constricted until it reaches a point, where the amplifier begins to enlarge into the bell portion thereof. In eliminating the objectionable features, an amplifier or tube is produced, which travels laterally of the record, and, as one body with the reproducer and its arm; the amplifier being so shaped, mounted, and supported as to allow the reproducer to be raised, and, in so doing, the tone-arm is moved telescopically and longitudinally with regard to the remainder of the amplifier. This amplifier comprises an intermediate supported portion, known as the compound curved tubular member, and two free end portions, correspondingly curved, telescopically and longitudinally movable in regard thereto, one being classed as the bell member, while the other is the tone arm. The bell member, however, cannot only move telescopically, with relation to the

compound curved member, but may be oscillated laterally, because it is provided with a contracted curved portion, which is telescopically movable with regard to a tubular member correspondingly curved. This tubular member, in other words, is an additional compound curved member, which is telescopically movable with regard to the first-named compound curved tubular member. In Figure 6, however, the bell member is allowed to oscillate laterally, because it consists of two parts, the bell member and the extension thereof, joined together by one, two or three threads; the extension being telescopically movable relatively to the compound curved tubular member, for instance, the first-mentioned compound curved member. This same structure is shown also in Figure 5 in side elevation. The invention not only embraces the above features, but embodies means, whereby as the bell member is raised and lowered, the extension thereof moves exactly concentric in conjunction with the compound curved member, and may be held in any desired position. When the reproducer is lifted to the fullest extent above the record, it may be readily supported, as shown in dotted lines.

The drawing only discloses one form of the invention, but in practical fields this form may necessitate changes and alterations, to which the applicant is entitled, provided such changes and alterations are comprehended by the appended claims.

Referring to the drawings,

Figure 1 is a side elevation of a talking machine, generally known as the cylinder machine, provided with what is known in the art as the compound curved tubular member, for the support of the free moving parts of the amplifier.

Figure 2 is a detail perspective view of the connection between the reproducer arm, the guide rod therefor, the sleeve upon the guide rod, and the connection between the sleeve and the compound curved tubular member.

Figure 3 is a detail sectional view longitudinally through the structure shown in Figure 2.

Figure 4 is a top plan view of the amplifier, showing the first named compound curved tubular member, the tone arm, the bell member having a curved portion at its contracted end, and the extension or second named compound curved tubular member, correspondingly curved with regard to the

first-named compound curved tubular member and the curved contracted end of the bell member.

Figure 5 is a side elevation of the first-named compound curved tubular member, a portion of the tone arm, a portion of the bell member and its extension, showing the threaded connection between the extension and the bell member, and clearly disclosing the fact that these parts are telescopically movable with regard to one another, and further showing the means whereby the extension and the bell member may move exactly concentric with regard to the compound curved member.

Figure 6 is a top plan view of the structure shown in Figure 5.

Figure 7 is a detail elevation of the joint or connection between the extension or the second-named compound curved tubular member and the first-named compound curved tubular member.

Figure 8 is a side elevation of the same form of machine as shown in Figure 1, only illustrating the fact that the bell member has a curved contracted end portion and fulcrumed upon the reproducer arm, and showing that the curved contracted portion is telescopically movable with regard to the tone arm.

Figure 9 is a sectional view on line 9—9 of Figure 5.

As to the drawings, 1 denotes the casing of the talking machine, containing the usual mechanism, (not shown), for rotating the record and the mandrel; the structure of the mandrel forms no part of the present invention.

In mounting an amplifier upon this style of machine, the same necessarily has to be moved laterally, and as one body, with the reproducer and its arm. This lateral movement is accomplished by disposing of the usual form of guide rod (which is usually cylindrical) and in its place the rod 2 is arranged. This rod 2 is rectangular in cross section, and receives the sleeve 3. This sleeve 3 is slidable laterally upon the rod 2, for the reason that it is provided with a rectangular bore 4. The ends of the rod 2 may be supported in bearings of the frame of the machine in any conventional manner, as shown at 5. It is to be understood that in practice the ends of this rod must be so mounted as to allow the same to be removed, for instance, the ends of this rod may only have sufficient frictional bearings in the frame of the machine, of such a character as to allow the same to be readily moved by forcing a sliding action thereto. The outside circumference of the sleeve 3 is cylindrical in order to provide a pivotal bearing for the reproducer arm 6, and is provided at one end with threads 7, to receive the threaded nut 8, which prevents displace-

ment, laterally, of the reproducer arm. It will be readily understood that the reproducer arm may be easily raised and lowered upon the sleeve. At one end of the sleeve, an arm 9 rearwardly projects, and where this arm forms a part of the sleeve, a shoulder 10 is provided, against which the reproducer arm 6 abuts. Between this shoulder and the nut, the reproducer arm 6 is positioned. The rearwardly projecting arm 9 extends rearwardly sufficient to allow the reproducer arm to swing or oscillate upon an arc of a circle, using the rod 2 as a center. The rearwardly extending arm 9 connects with the compound curved tubular member 11. This connection between the arm 9 and the member 11 may be integral, as shown in Figure 1, or detachable, as shown in Figure 5. If made detachable, the arm 9 and the arm 12 are made in one piece, and where they project from the compound curved tubular member, they are recessed to receive the said member 11, and are clamped to the member 11 by the plate 13.

The reproducer arm 6 carries the usual form of reproducer 14, to which is connected the tone arm 15, by means of the threaded connection 16. This tone arm 15 is correspondingly curved with regard to the compound curved tubular member 11, in order that when the reproducer and its arm 6 is lifted or raised from the record, the tone arm will telescopically move relatively to the curved member 11. When the reproducer and its arm is raised or lifted, the same is supported in such position by the slight curve 17 of the tone arm coming in contact with the upper forward end 18 of the member 11, as shown in dotted lines in Figure 1. 19 represents the bell member of the amplifier having a contracted end portion 20, which terminates into a curved portion or neck 21. 22 denotes an additional compound curved tubular member, the portion 23 of which is correspondingly curved with relation to the curved portion or neck 21, and is designed to telescopically receive said portion or neck 21, while the portion 24 of the additional compound curved tubular member is curved correspondingly with regard to the first-named compound curved tubular member and is received thereby. The compound curved tubular member 11 in Figure 1 is formed with an arm 25 (which is similar to the arm 12 in Figure 5), it being possible to mount the arm 25 in the same manner as the arms 9 and 12 are mounted on the said member 11. This arm 25 extends to a point, marked 27^a on which the arc of a portion of the member 11, and the portion 24 of the member 22 are curved. The extremities of the arms 25 and 12 are bifurcated, as shown clearly in Figures 4, 6 and 7, in order to receive the extremity of the arm 26, or it may be plain, as shown in Figures 1

and 5, and the extremities of the arms 25 and 12 and the arm 26 clamped together by means of a bolt and winged nut 27 and 28. When the arms 25 and 12 having the bifurcated portion receive the extremity of the arm 26, they are clamped in position by the aid of the bolt 29 and the winged nut 30, as shown clearly in Figures 4, 6 and 7, thereby holding the bell member, and the additional compound curved tubular member in various positions. By the production of these cooperating arms 25 or 12 and the arm 26, the bell member and the extension thereof or the additional compound curved member 22 may be moved or oscillated exactly concentric with regard to their centers. The arm 26 may be detachably connected with the portion 24, in the same manner as the arms 9 and 12 are connected in Figure 5.

Attention is directed to the structure shown in Figure 5, in which the bell member 19 has its contracted portion 20 terminating in a downwardly curved portion or neck 31. This downwardly curved portion 31 has threaded connections with the extension 32 of the bell member, as at 33, whereby the bell member may be allowed to oscillate laterally of the machine. This extension 32 is curved correspondingly with regard to the member 11 and is telescopically received thereby, so that the bell member may be raised or lowered. When the bell member 19 is raised or lowered, the same may be held in various positions by tightening up the winged nut 30, or the winged nut 28 in Figure 5. It will be evident, upon referring to Figure 5, that the arm 26 may be connected to the extension at any suitable location, in practice, in order that the throw of the bell member may be increased or decreased.

It will be observed that when it is desired to adjust the bell member 19 in Figure 1, the curved neck 21 cooperates with the portion 23 of the additional compound curved member 22. It will be evident that this portion 23 in practice may be changed somewhat in shape to vary the lateral oscillation of the bell member. The bell member is limited in its oscillation by the contracted portion 20 coming in contact with the extremity of the curved portion 23, when moving in one direction, and when in the other direction, the contracted portion 20 contacts at the point 35, where the portion 23 merges into the portion 24 of the additional compound curved tubular member. Arms similar to the arms 25 and 26 may be provided to cooperate with the contracted portion 20 of the bell member and the curved portion 23, in order to cause the bell member to oscillate exactly concentric with the center of the neck 21 and the portion 23.

It is further evident that the forward weight of the bell member is directly above the body of the machine and its casing,

which equally balances with the rearwardly extending portions of the amplifier or the telescopically connected sections. In this manner, the equilibrium of the machine is readily maintained.

In Figure 8 the tone arm 15 is connected to the reproducer 14 in the same manner as shown in Figure 1, for instance by a threaded connection, and designated by the same character 16. The bell member 19 terminates into a curved portion or neck 36, which is correspondingly curved with regard to the tone arm 15, and is received thereby. The bell member is provided with an arm 37, which may be integral or detachably connected therewith. The reproducer arm 6 in Figure 8 is formed with an arm 38. This arm 38 is provided with the bifurcated end similar to the arms 25 and 12, as shown clearly in Figure 7, and in the bifurcated portion of this arm 38 the extremity of the arm 37 is disposed. The bifurcated end of the arm 38 and the extremity of the arm 37 have a bolt 39 penetrating them, and to the threaded end of the bolt, the winged nut 40 is applied. The bolt 39 is similar to the bolt 29 in Figure 7. As the bell member 19 is raised or lowered, the curved portion or neck 36 moves telescopically with regard to the tone arm 15, and exactly concentric therewith, because of the connections between the arms 37 and 38. It may be clearly noted how the various structures in the drawings are operated. It will be further observed that this form of amplifier embodies various novel features, which have heretofore not been conceived, and in so constructing an amplifier of this design, for application upon a machine of this type, the same moves laterally with regard to the machine and the record. It is understood that no matter where the amplifier is positioned as it is moving laterally of the record, the bell member may be oscillated laterally.

The curved portion or neck 21 and the curved portion 23 are provided with pivoted cooperating arms 42 and 43 similar to the arms 25 and 26. These arms are connected by a bolt and a winged nut 44 and 45.

In order to assemble the portions 21 and 23, the portion 21 is made in two parts 46 and 47, the part 47 being first inserted in the portion 23, after which the part 46 is telescopically connected to it by a beveled joint, and then securely soldered or otherwise fastened or made permanent. This is only one method of assembling the portions 21 and 23, it being evident that other methods may be employed.

The invention having been set forth, what is claimed as new and useful is:

1. A laterally movable amplifying horn; comprising a compound curved tubular member; and telescopically movable free

portions correspondingly curved and supported from either end of the member.

2. A laterally movable amplifier; comprising a compound curved tubular member; telescopically movable free portions correspondingly curved and supported from either end of the member; and means permitting one of the free portions to move concentrically with regard to the member.

3. A laterally movable amplifying horn; comprising a compound curved tubular member; telescopically movable free portions correspondingly curved and supported from either end of the member; and means permitting the adjustment and support of either of the free portions in various positions.

4. A laterally movable amplifier; comprising a compound curved tubular member; telescopically movable free portions correspondingly curved and supported from either end of the member; means permitting one of the free portions to move concentrically with regard to the member; the means including means for allowing the adjustment and support of one of the free portions in various positions.

5. In an amplifier; a compound curved tubular member; and a free end portion having telescopically movable connecting means with the member, whereby the free end portion may have universal movements.

6. In an amplifier; a compound curved tubular member; and a free end portion having telescopic connecting means with the member, whereby the free end portion may have universal movements; and means permitting the free end portion to move concentrically with regard to the member.

7. In an amplifier; a compound curved tubular member; a free end portion having telescopically movable connections with the member, whereby the free portion may oscillate laterally and vertically; means permitting the free end portion to move concentrically with regard to the member; the means including means for holding the free end portion in adjusted positions when moved.

8. In an amplifier; a compound curved tubular member; an additional compound curved tubular member telescopically united with the first tubular member; a free end portion having an extension correspondingly curved with regard to the additional compound curved member and telescopically connected to it; said additional compound curved member constituting a medium to permit the free end portion to oscillate laterally and vertically.

9. In an amplifier; a compound curved tubular member; an additional compound curved tubular member telescopically united with the first tubular member; a free end portion having an extension correspond-

ingly curved with regard to the additional compound curved member and telescopically connected to it; said additional compound curved member constituting a medium to permit the free end portion to oscillate laterally and vertically; and means permitting the free end portion and the additional compound curved member to move concentrically with regard to one another.

10. In an amplifier; a compound curved tubular member; an additional compound curved tubular member telescopically united to the first tubular member; a free end portion having an extension correspondingly curved with regard to the additional compound curved member and telescopically united to it; the additional compound curved member constituting a medium to permit the free end portion to oscillate universally; means permitting the free end portion, when oscillated in one direction, to move concentrically with regard to one member and, when oscillated in the other direction, to move concentrically with regard to the other member; the means including means to hold either the additional compound curved member or the free portion in adjusted positions.

11. In an amplifier; a compound curved tubular member; a free portion having connections with the member; the connections embodying correspondingly curved telescopically movable united parts to permit the free portion to move universally through the medium of the parts; the connections including means whereby the free portion may move concentrically with regard to the member.

12. In an amplifier; a compound curved tubular member; a free portion having connections with the member; the connections embodying correspondingly curved telescopically movable united parts to permit the free portion to move universally through the medium of the parts; the connections including means whereby the free portion may move concentrically with regard to the member; the means for permitting the free portion to move concentrically embodying means to hold the free portion in various adjusted positions.

13. In an amplifier; a compound curved tubular member; an additional compound curved tubular member telescopically united with the first tubular member; a free end portion having an extension correspondingly curved in regard to the additional compound curved member and telescopically united to it; the additional compound curved member constituting a medium to permit the free end portion to oscillate universally; means permitting the free end portion and the additional compound curved member to move concentrically with regard to one another; and means permitting the

additional compound curved member to move concentrically with regard to the first compound curved member.

14. A laterally movable amplifying horn
5 comprising a compound curved tubular member; movable free portions, correspondingly curved and telescopically connected to the member to have longitudinal telescopic movements therewith, one of the free portions embodying such connections with the
10 member as to permit the same to oscillate universally; means permitting one of the

free portions to move concentrically with regard to the member, and including means to hold one of the free portions in its adjusted positions. 15

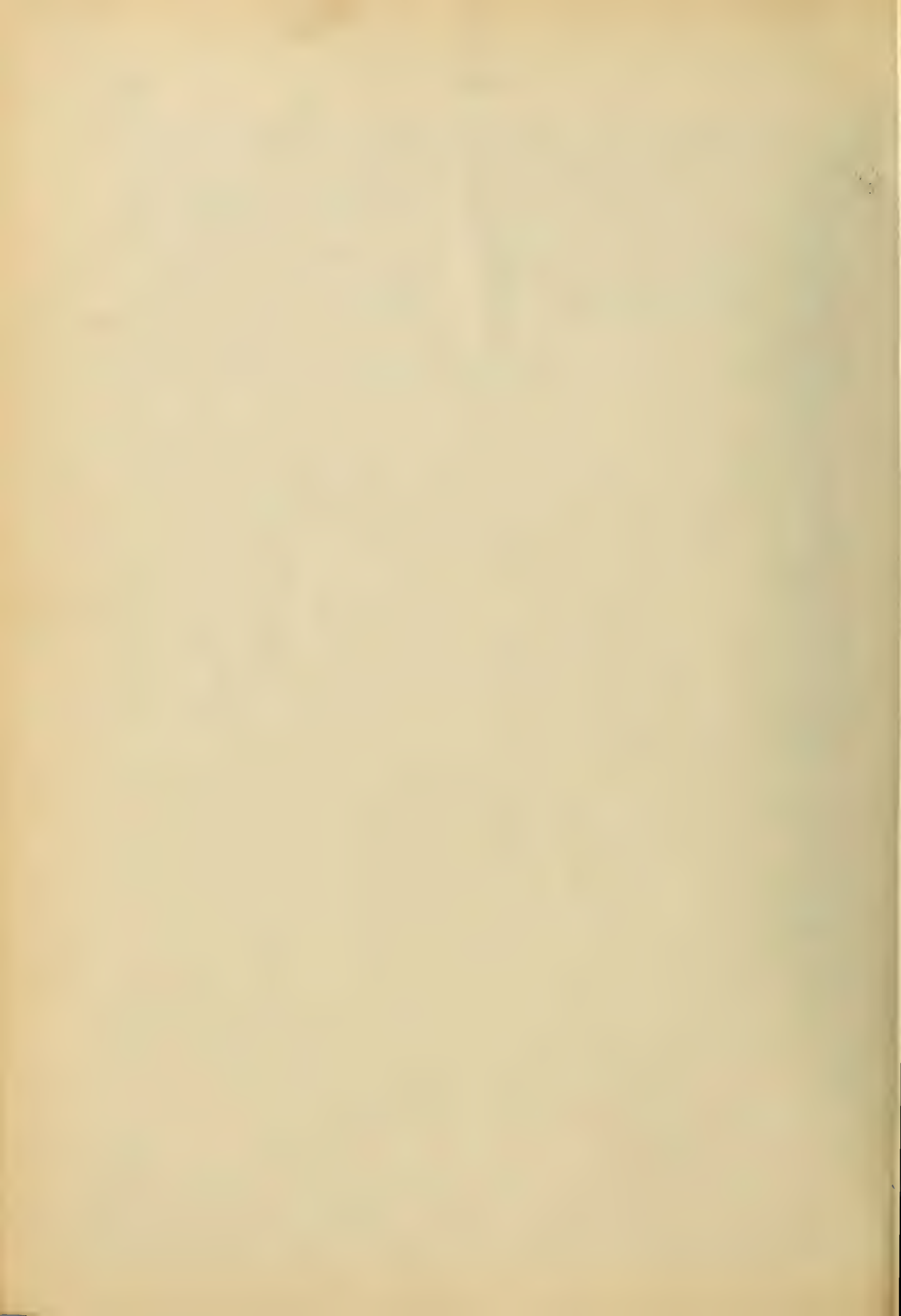
In witness whereof, the applicant's signature, is hereunto affixed in the presence of two witnesses.

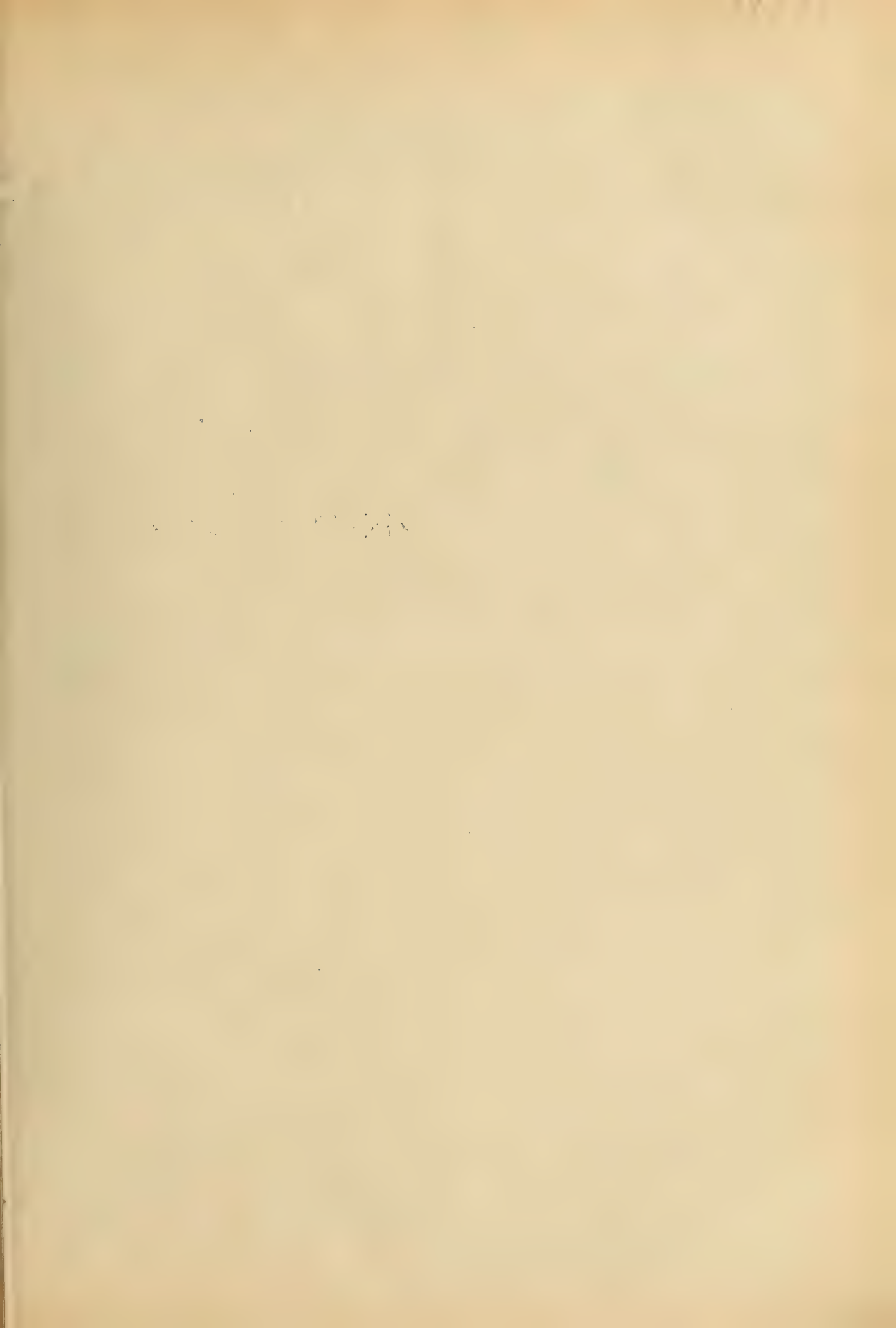
ROBERT A. BOSWELL.

Witnesses:

HERBERT D. LAWSON,
WILLIAM CRICHTON CLARKE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."





G. L. STEVENSON.
HORN.
APPLICATION FILED APR. 15, 1910.

997,870.

Patented July 11, 1911.

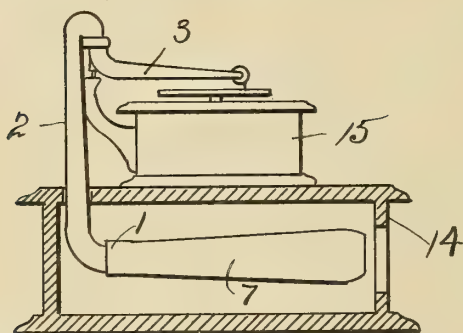


Fig. 1.

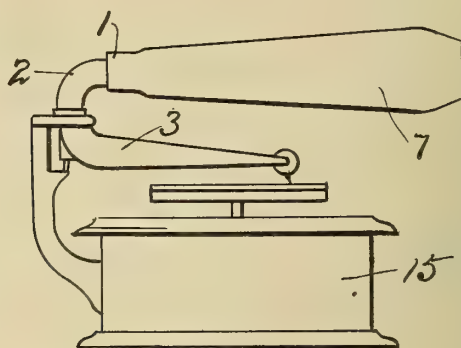


Fig. 2.

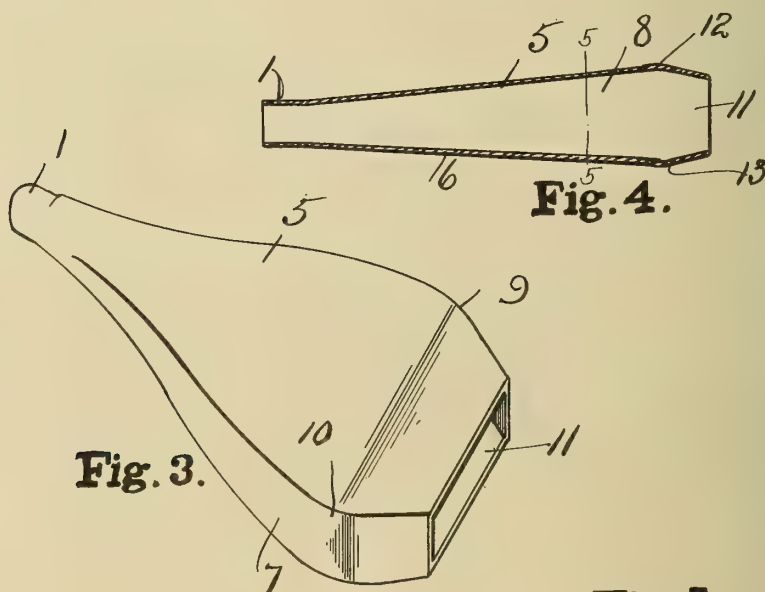


Fig. 3.

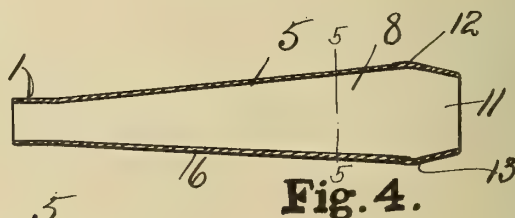


Fig. 4.

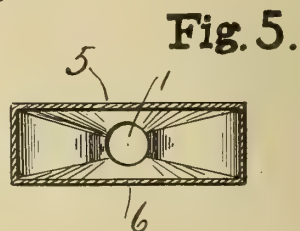


Fig. 5.

WITNESSES
E. J. Ogden
Frederic A. Greene

INVENTOR
George L. Stevenson.
BY
Howard C. Barlow.
ATTORNEY

UNITED STATES PATENT OFFICE.

GEORGE L. STEVENSON, OF PROVIDENCE, RHODE ISLAND. ASSIGNOR TO HOUSEHOLD CABINET WORKS, OF PROVIDENCE, RHODE ISLAND, A CORPORATION OF RHODE ISLAND.

HORN.

997,870.

Specification of Letters Patent.

Patented July 11, 1911.

Application filed April 15, 1910. Serial No. 555,638.

To all whom it may concern:

Be it known that I, GEORGE L. STEVENSON, a citizen of the United States, residing at the city of Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Horns, of which the following is a specification, reference being had therein to the accompanying drawing.

10 This invention relates to a sound amplifying device, commonly known as a horn, the same being more particularly adapted for use on sound reproducing instruments such as phonographs or the like.

15 The object of the invention is to construct a horn having unusual acoustic properties whereby the sound is not only amplified but where the phonetic principles of clear, articulate, yet soft and mellow sound are produced, in contrary distinction to the effect of the ordinary flaring or bell-mouthed horn which merely enlarges the sound without refining it.

25 A further object of the invention is to provide a horn that in addition to being simple and inexpensive in construction takes up but comparatively little room when used either inside or outside of a phonograph supporting cabinet, or upon being stored away when not in use.

30 With these and other objects in view, the invention consists of certain novel features of construction, as will be more fully described and particularly pointed out in the appended claims.

35 In the accompanying drawings: Figure 1—shows my improved horn as mounted on the inside of a cabinet or box on which the phonograph is supported. Fig. 2—illustrates the horn as applied to the ordinary inexpensive phonograph instrument. Fig. 40 3— is an enlarged perspective view of my improved horn showing the walls of the same turned inward at its mouth end forming a contracted opening instead of being turned outward as is the usual custom. Fig. 4— is a central longitudinal section through this horn. Fig. 5— is a transverse sectional view of the horn on line 5—5 of Fig. 4.

50 In carrying out my invention I have provided an improved horn which is preferably constructed with a contracted neck portion 1 adapted to be connected by a tube 2, or other suitable means to the needle carrying or sound transmitting arm 3. This neck por-

tion is then gradually enlarged into the body portion substantially rectangular in cross section, whose top and bottom plates 5 and 6 are broad and substantially flat and whose sides 7 and 8 are comparatively narrow and set substantially at right angles to said top and bottom sections, said top, bottom and sides forming, in effect, sounding boards. The sides of the body after diverging or rounding outward for about three-quarters of the length of the body then converge or turn inward as at 9 and 10 toward the open end forming a contracted mouth or opening 11 through which the sound is emitted. The top and bottom sections 5 and 6 after spreading apart slightly from the neck portion 1 may also converge or draw rather abruptly inward as at 12 and 13 making a still further contraction to the mouth 11. This last contraction, however, is not absolutely essential as these plates may be straight completely to the mouth if desired. This horn may be made of any desired or suitable material but I preferably construct the same like a violin body of thin boards or plates of wood, and join the sections together by glue or by other suitable means. It is found in practice, outside of the acoustic properties of this style of horn, that it is very inexpensive in construction as compared with the flaring bell-shaped horn, also that it takes up very much less room than the old style horn and can be packed or stored away in much less space. This horn is particularly adapted to be used within a cabinet or box 14 and connected to the musical instrument 15 by a tube, if desired, as illustrated in Fig. 1, or it may be connected on the outside and above the instrument itself, as illustrated in Fig. 2, or in any other suitable or convenient way.

My improved construction or form of horn, has an enlarged thin flat tubular sound amplifying body substantially rectangular in cross section, as illustrated in Fig. 3, in which there is a small neck portion through which the sound enters and a somewhat contracted mouth or opening at the opposite end through which the sound is emitted, thus being in form and effect similar to the human throat, mouth cavity and opening through the lips between the teeth, the converging portions 9, 10, 12 and 13 being similar in effect to the roof of the mouth, gums and teeth forming

the sounding-board for reverberating, amplifying and mellowing the sound waves while passing through the horn.

The shape of the horn as best shown in Fig. 3 provides wide upper and lower plates 5 and 6 which, especially when made of thin wood, enable a resonance to be obtained which can be compared with that of a violin. This resonance cannot be obtained from a plurality of narrow strips. Therefore the said shape of the horn not only mellows the sound waves in the manner hereinbefore mentioned as comparable with the mellowing effect produced upon the human voice by the shape of the mouth, but also attains the amplifying and resonant effect obtained from broad, thin, single sheets of wood.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. A horn having relatively wide and flat

upper and lower plates forming sounding boards, and relatively narrow sides connecting said plates and also serving as sounding boards, said plates and sides diverging from the inlet end of said horn, the outlet ends of said sides being turned inwardly to form a contracted mouth. 25

2. A horn having relatively wide and flat upper and lower plates forming sounding boards, and relatively narrow sides connecting said plates and also serving as sounding boards, said plates and sides diverging from the inlet end of said horn, the outlet ends of said sides and said top and bottom plates being turned inwardly to form a contracted mouth. 35

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE L. STEVENSON.

Witnesses:

WALTER H. BARNEY,
EDWIN B. LINCOLN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

C. A. COOPER.
 PHONOGRAPH CABINET.
 APPLICATION FILED APR. 15, 1910.

997,905.

Patented July 11, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

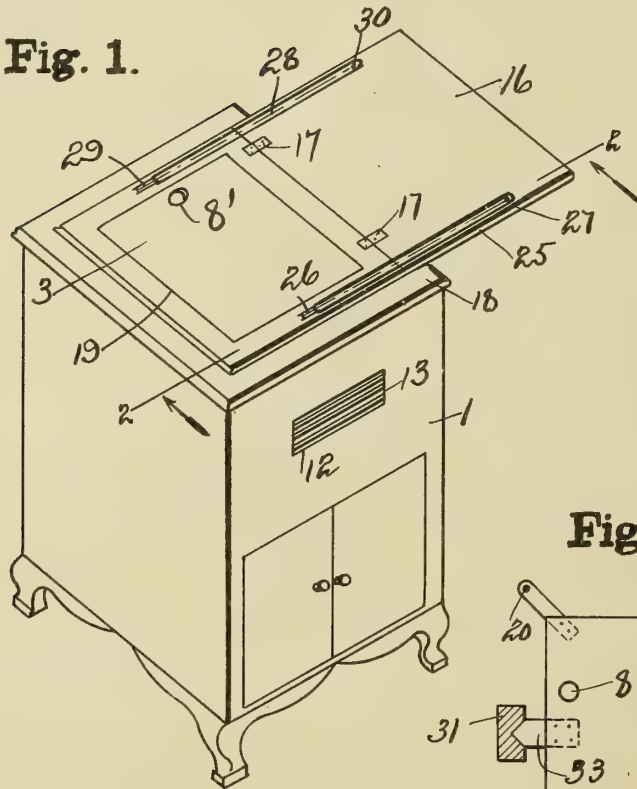


Fig. 3.

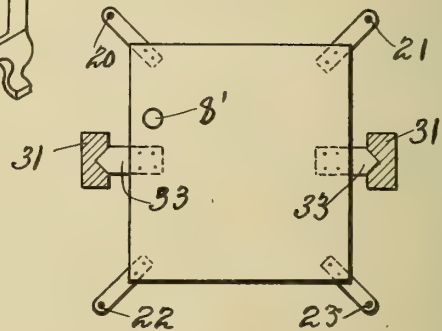
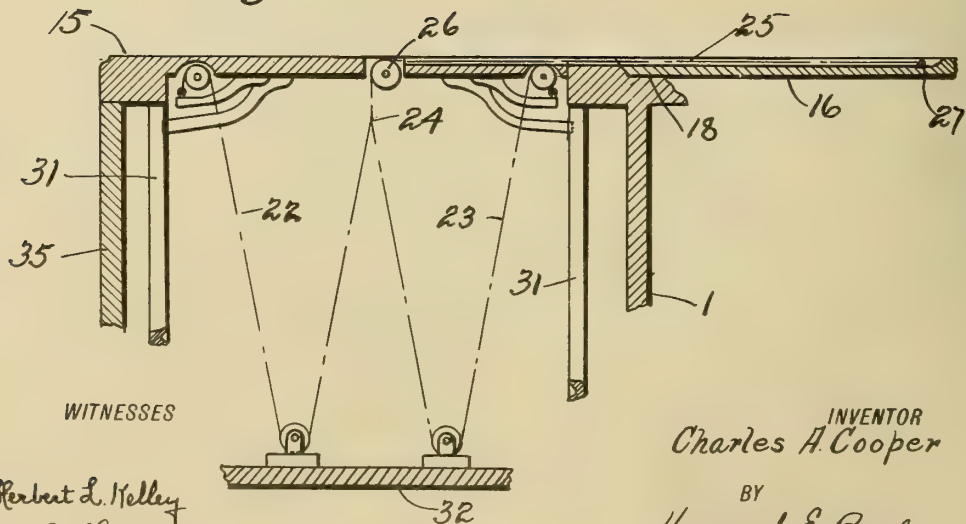


Fig. 2.



WITNESSES

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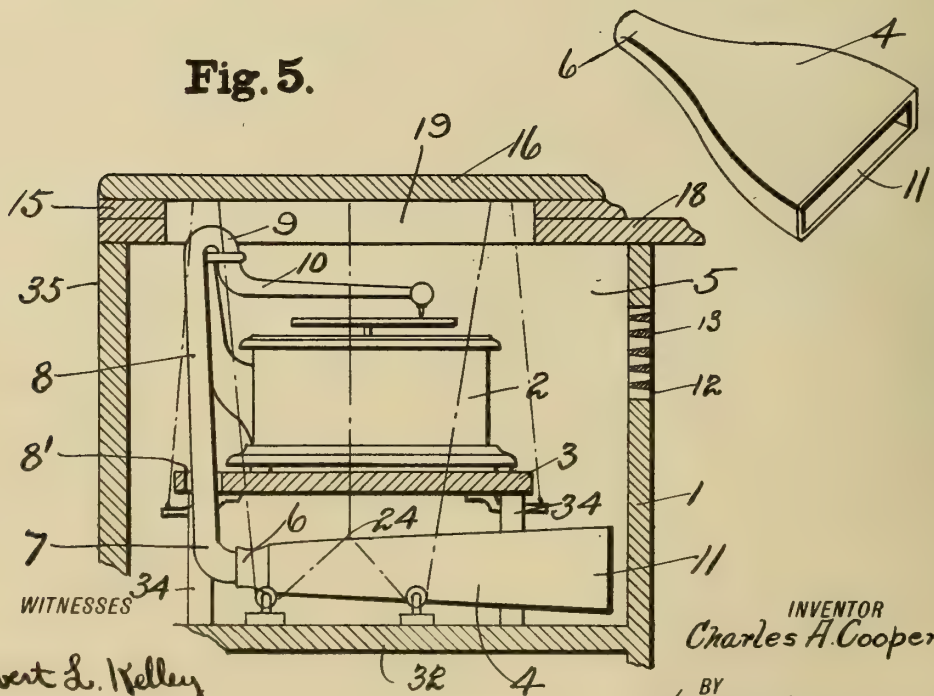
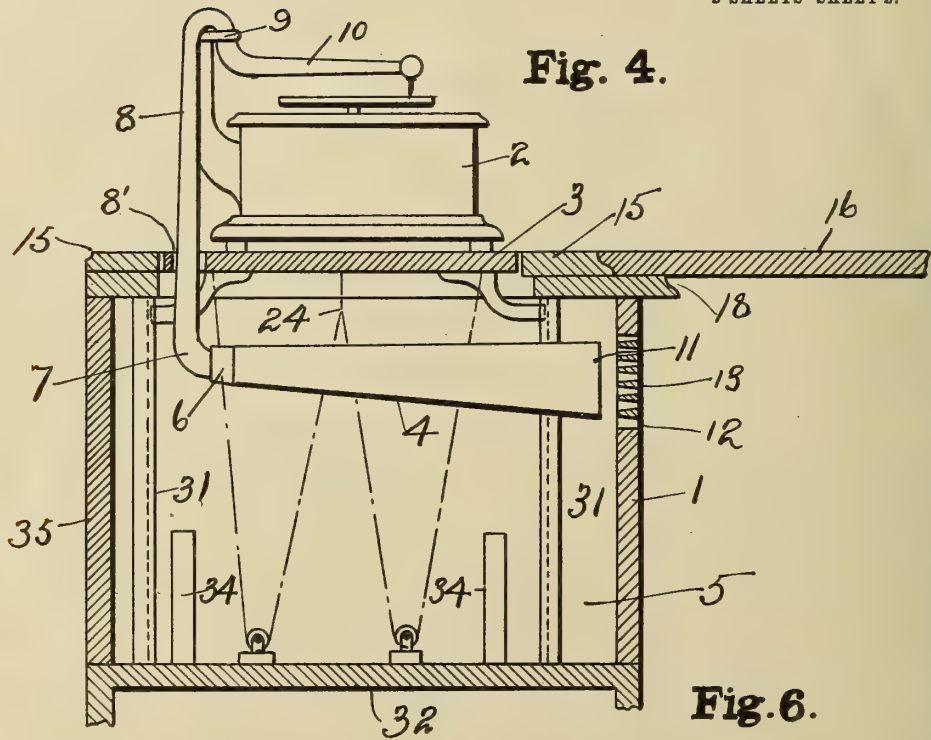
BY
 Howard E. Barlow
 ATTORNEY



997,905.

Patented July 11, 1911.

2 SHEETS—SHEET 2.



Herbert L. Kelley
 E. J. Ogden

INVENTOR
 Charles A. Cooper
 BY
 Howard E. Barlow
 ATTORNEY

UNITED STATES PATENT OFFICE.

CHARLES A. COOPER, OF NEW YORK, N. Y., ASSIGNOR TO HOUSEHOLD CABINET WORKS,
OF PROVIDENCE, RHODE ISLAND, A CORPORATION OF RHODE ISLAND.

PHONOGRAPH-CABINET.

997,905.

Specification of Letters Patent.

Patented July 11, 1911.

Application filed April 15, 1910. Serial No. 555,623.

To all whom it may concern:

Be it known that I, CHARLES A. COOPER, a citizen of the United States, residing at the city of New York, in the county of New York, and State of New York, have invented certain new and useful Improvements in Phonograph-Cabinets, of which the following is a specification, reference being had therein to the accompanying drawing.

The object of this invention is to provide a drop-head table or cabinet, in which a panel, head, or movable section is arranged to support a sound reproducing instrument, such as a phonograph or the like, said instrument being provided with a horn or suitable device for enlarging, intensifying and diffusing the sound produced by said instrument, said horn being mounted beneath the panel within the cabinet and arranged to be raised and lowered with the instrument and said movable panel.

A further object of the invention is to provide an opening through the outer wall of the cabinet adapted to register with the mouth of the horn when raised to its operative position, to permit the sound to pass out therethrough, said opening being provided with a plurality of longitudinal bars or members to aid and assist the acoustic properties of the horn.

With these and other objects in view, the invention consists of certain novel features of construction, as will be more fully described and particularly pointed out in the appended claim.

In the accompanying drawings: Figure 1— is a perspective view illustrating a cabinet having a drop head or movable section, the same being in its raised position and the operating leaf in its extended position. Fig. 2— is an enlarged sectional view on line 2—2 of Fig. 1 through the hoisting mechanism, illustrating the movable section in its raised position. Fig. 3— is a plan view of the drop head showing the relative position of the vertical guides and the members by which the head is supported. Fig. 4— is a central sectional side

elevation of the cabinet showing the instrument in position on the drop head and the horn supported from said instrument within the cabinet, the whole being in its raised or operative position. Fig. 5— is the same as Fig. 4 showing the cabinet as closed and the instrument and horn lowered into the cabinet to its inoperative position. Fig. 6— is a detail of one style of horn which may be supported within the cabinet to be raised and lowered with the phonograph and the drop head.

Referring to the drawings 1 designates the cabinet which is designed more particularly for the support and reception of a phonograph 2 or other sound reproducing instrument, which is adapted to rest upon the drop head or movable section 3 thereof. The horn 4 or sound elaborating device is designed to be supported by any suitable means below the drop head and within the cabinet chamber 5, so that said horn will move up and down with each movement of said head. This horn may be of any desired or convenient shape and is preferably mounted in a horizontal position, its rear end being provided with a contracted neck portion 6 into which fits the lower end 7 of the tube 8, this tube then extends upward therefrom through the opening 8' in the drop head, the upper end of said tube being connected at 9 to the usual sound transmitting arm 10. When the horn and drop head are in their raised or operating position the mouth 11 of the horn is brought into a position to register with the opening 12 in the front wall of the cabinet. Thin bars 13 of wood or other suitable material, preferably tapering in cross section from the outside inward, are placed at close intervals longitudinally across this opening primarily for the purpose of aiding in obtaining a more effective distribution of the sound emitted through the horn. These bars also serve as an ornament in the design of the cabinet for partially closing the opening 12.

The top portion 15 of the table or cabinet is preferably provided with an outwardly swinging or extending leaf or member 16

hinged at 17 and when in its extended position it lies against and is supported on the ledge 18. This top portion is provided with an aperture 19 into which is
 5 designed to fit the instrument supporting drop head or movable section 3. Cords 20, 21, 22 and 23 are preferably connected to the four corners of this movable section, the cords 22 and 23 being brought together
 10 as at 24, see Fig. 2, into the single cord 25, led out over pulley 26 and secured at 27 to the extension leaf, see Fig. 1, while the cords 20 and 21 on the opposite side of the movable section are brought together in a
 15 similar manner and led out by the single part 28 over pulley 29 and is fastened at 30 to the opposite edge of the extension leaf 16. Suitable guide bars 31 are arranged to extend from the table top down to an inclosing
 20 partition 32, which bars are engaged by the ends of the guide arms 33. I do not restrict myself to this particular arrangement for operating this drop head as any desirable or suitable means may be employed for this
 25 purpose.

The space above the partition 32 forms a convenient inclosing receptacle into which the drop head with its horn and its supported machine may be lowered, said head
 30 being adapted to rest upon the four upright supporting posts 34, which receive the weight and prevent the horn from coming into contact with said partition.

The lower portion of this cabinet may be provided with shelves or otherwise arranged for the reception of the collection of record
 35 disks used in connection with the phonograph.

In the operation of my improved phonograph cabinet the leaf 15 is swung back to its extended position, as shown in Fig. 1. The phonograph is set upon the drop head, the horn 4 is passed through the removable
 40 section 35 in the back of the cabinet and connected to the machine by means of the tube 8, which may serve, if desired, as the only supporting means for said horn. By this arrangement the horn is entirely concealed and the tone is rendered soft and
 45 mellow by being conducted down through the cabinet 5 and out through the barred opening in the wall thereof. By this means the large, unwieldy and in some cases unsightly horn, ordinarily employed with this
 50 class of phonograph is entirely eliminated, enabling the machine and all of its attachments to be inclosed within the cabinet when desired.

When the phonograph is no longer required for immediate use it is only necessary to raise the free end of the leaf 3 and fold it over the top of the cabinet, whereby
 60 the drop head with its supported machine and horn will at once descend bodily into the compartment below, the aperture left

by the retreating head being covered by the leaf, leaving the face of the table plain and clear for other purposes. The machine and its attachments thus disposed of are entirely inclosed, are out of the way and protected from dirt and dust. 70

When it is again desired to operate the machine it is only necessary to raise the leaf, swing it outward on its hinges, thereby bringing the machine up level with the surface of the table and the mouth of the horn in position to register with the opening in the cabinet wall, it being then only necessary to position the records and the machine is ready for operation. 75 80

As shown by comparing Figs. 4 and 5, the phonograph and its amplifying horn are not changed as to their relationship whether raised or lowered or during raising or lowering. Therefore the instrument could be
 85 started playing while in the position shown in Fig. 4 and then lowered to the position shown in Fig. 5 while still continuing to play. When in the latter position, the volume of sound of course would be materially
 90 reduced so far as the sound can be emitted from the receptacle portion of the cabinet. In brief no adjustment whatever has to be made of any of the parts or the relationship of some parts to others whether the instrument is to be brought out to play with full
 95 volume of sound, or is to be retired into the receptacle.

It will be observed that the drop head or instrument supporting section 3, when in
 100 raised position as shown in Fig. 4, substantially closes the opening in the top of the cabinet, thus confining the sound issuing from the horn to the space within the cabinet so that the sound issuing from the cabinet must come through the portion 12
 105 where the acoustic properties of the horn can be softened or controlled. While in this operative position the disk or records of the instrument may be changed without shifting drop head 3, and when desired the entire apparatus can be lowered entirely into the cabinet either while playing or when silent. The horn being under the section 3, and the latter closing the opening in the cabinet, result in the sound being exceedingly mellow, while still permitting the records of the instrument to be changed. 110 115

Having thus described my invention, what I claim as new and desire to secure by
 120 Letters Patent, is:

The combination with a cabinet having an opening in its top, and a drop head adapted to close said opening, of a sound reproducing instrument supported on said drop head, a horn connected with said instrument and located below said drop head, said cabinet having a sound outlet opening with which the outlet of said horn coincides when said drop head is raised, means in said last men- 125 130

tioned opening for diffusing the sound
emitted from said horn, whereby the full
volume of the sound is emitted when said
drop head is in raised position, and means
5 for operating said drop head, whereby the
said horn may be lowered below the plane
of said sound outlet opening to direct the
sound emitted from said horn against the

wall of said cabinet to deflect the same be-
fore it reaches said outlet opening. 10

In testimony whereof I affix my signature
in presence of two witnesses.

CHARLES A. COOPER.

Witnesses:

GARRETT D. COOPER,

H. I. CHATFIELD.

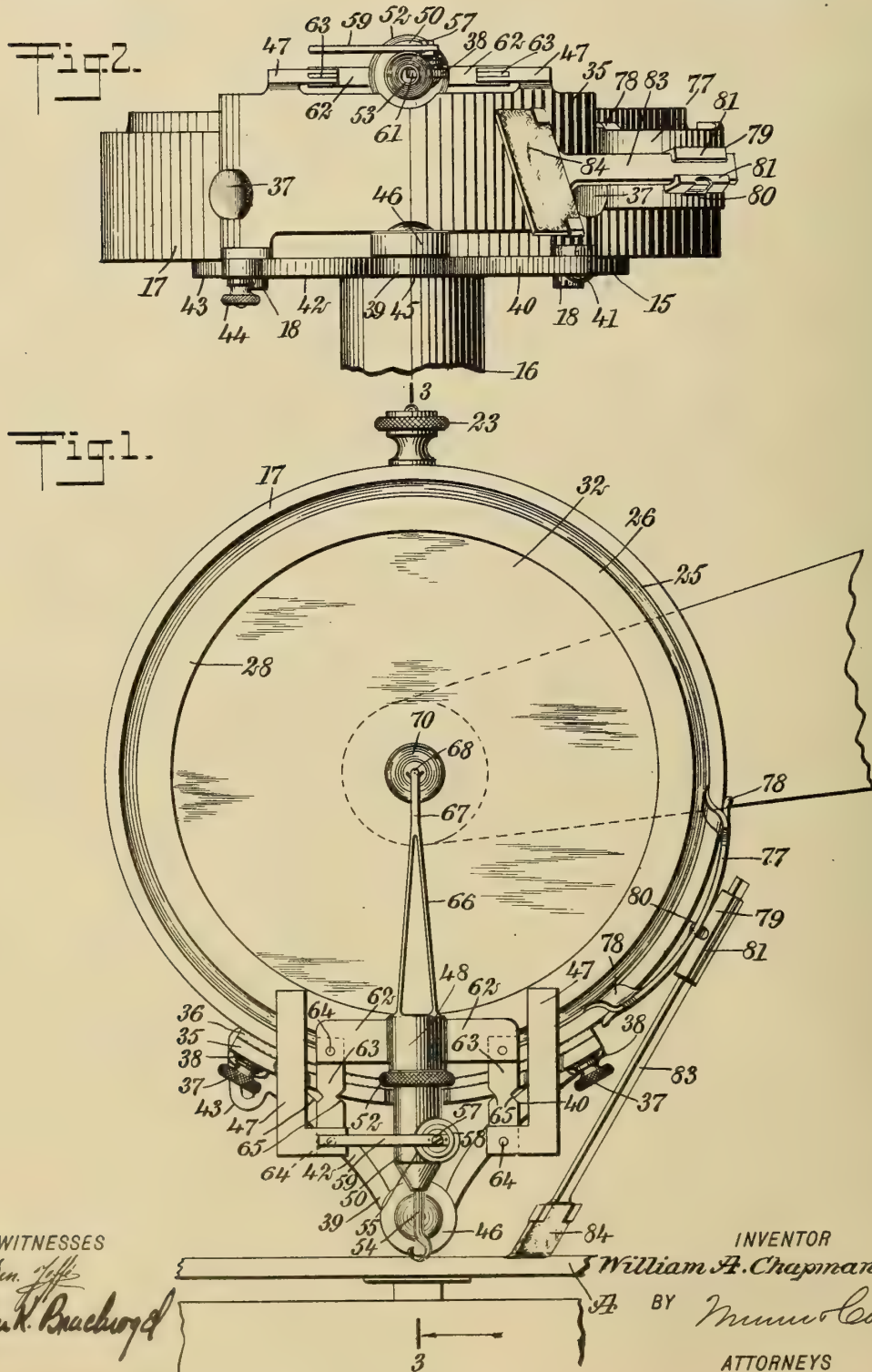
Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,
Washington, D. C."

W. A. CHAPMAN.
SOUND REPRODUCER AND RECORDER.
APPLICATION FILED AUG. 11, 1908.

998,465.

Patented July 18, 1911.

3 SHEETS—SHEET 1.



WITNESSES
Ben. J. Jeff
John H. Brachvogel

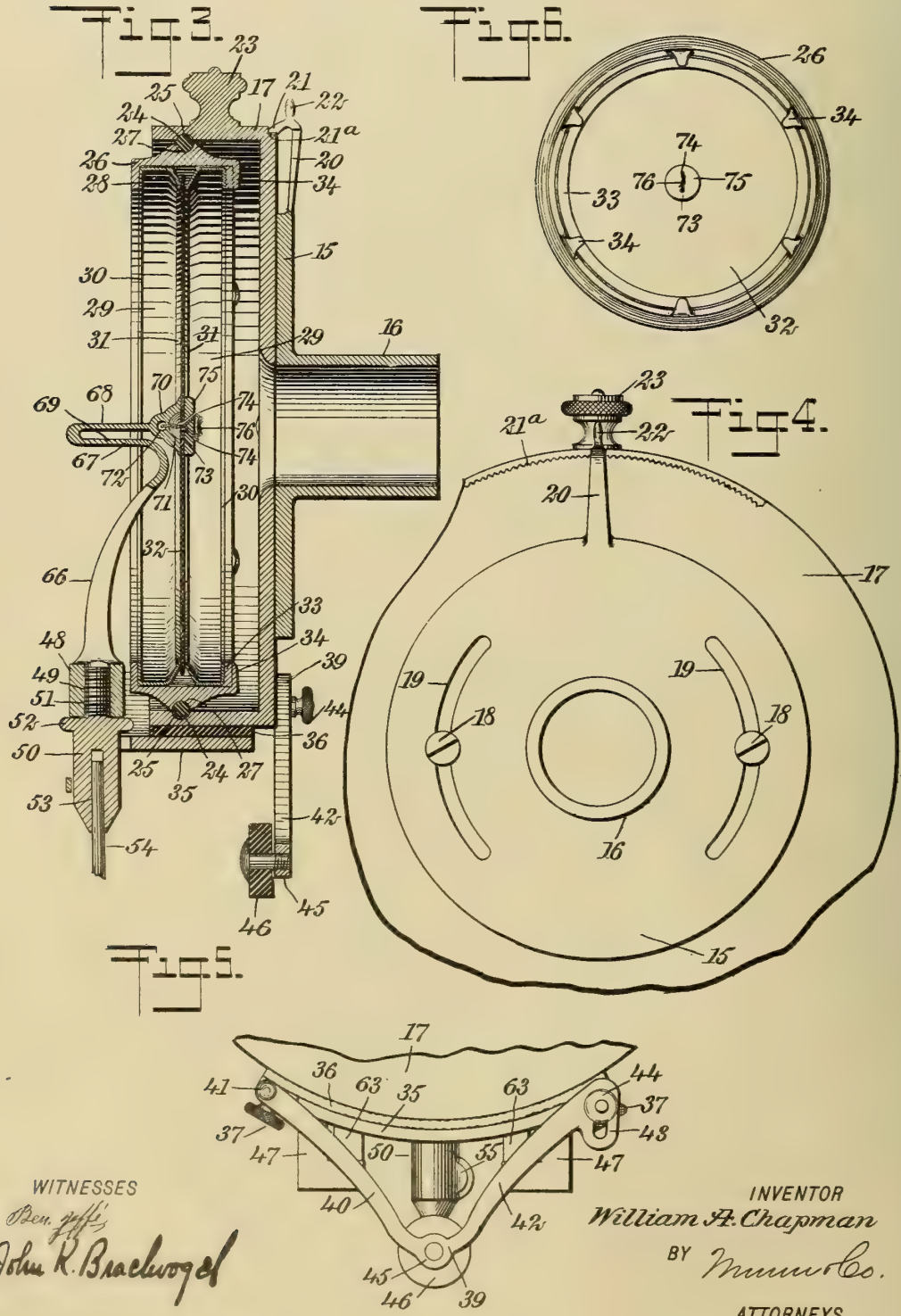
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3 SHEETS—SHEET 2.



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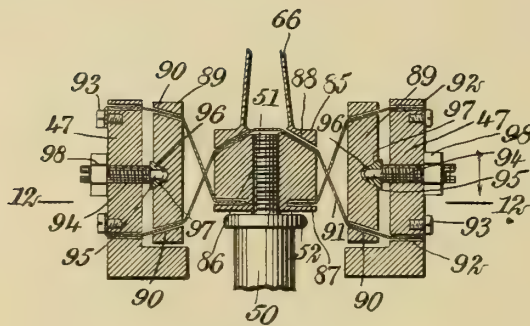
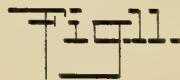
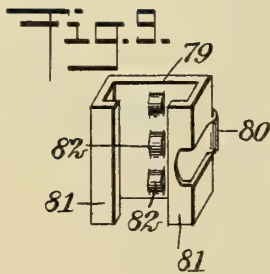
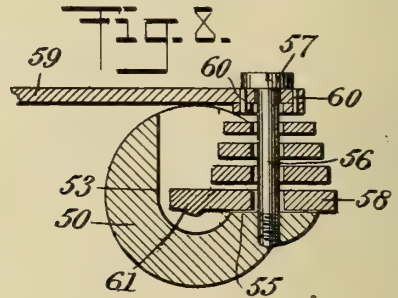
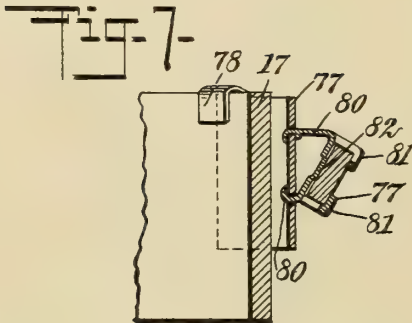


W. A. CHAPMAN.
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998,465.

Patented July 18, 1911.

3 SHEETS—SHEET 3.



WITNESSES

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UNITED STATES PATENT OFFICE.

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SOUND REPRODUCER AND RECORDER.

998,465.

Specification of Letters Patent. Patented July 18, 1911.

Application filed August 11, 1908. Serial No. 447,944.

To all whom it may concern:

Be it known that I, WILLIAM ALBERT CHAPMAN, a citizen of the United States, and a resident of Smithville, in the county of Lawrence and State of Arkansas, have invented a new and Improved Sound Reproducer and Recorder, of which the following is a full, clear, and exact description.

This invention relates to sound recorders and reproducers, and is particularly useful in connection with talking machines employing disk or other types of records upon which the sound waves are recorded in the form of grooves, and in which diaphragms are used to reproduce the sounds from the grooves, or to form the grooves upon blank records.

An object of the invention is to provide a simple, inexpensive and durable sound recorder and reproducer, which is adapted for the dual purpose of forming the sound recording grooves in the record, and for reproducing the sounds from grooves already impressed or formed upon the records, and which requires no structural or other change to fit it for either purpose, beyond replacing a recording needle or point by a reproducing needle or point or vice versa as the case may be.

A further object of the invention is to provide a device of the class described by means of which sounds can be reproduced with great clearness and power, and by means of which metallic, scratching or other undesirable sounds due to the contact of the record with the reproducing point are to a large extent eliminated.

A still further object of the invention is to provide a device of the class described in which the weight of the reproducer is supported not upon the recording or reproducing point or needle, but is carried by a special roller provided therefor and engaging the record for this purpose, in which the diaphragm is of special form and is free not only to vibrate but to move bodily, and in which the stylus bar is extensible and is carried by the sound box casing in such a manner that there is no metallic contact between the parts.

Another object of the invention is to provide a sound reproducer in which the stylus bar is of peculiar form to transmit the undulations of the sound grooves most efficiently to the diaphragm, and there convert them into diaphragm vibrations or move-

ments which cause the propagation of the sound waves, in which special means are provided for holding the recording or reproducing needles in place, and for adjusting them accurately so that the length of the stylus bar remains unchanged, and in which the stylus bar itself is flexibly suspended from a cradle secured to the sound box casing, though rigidly held against upward, lateral and torsional movements.

The invention consists in the construction and combination of parts to be more fully described hereinafter and particularly set forth in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views, and in which—

Figure 1 is a front elevation of one embodiment of my sound recorder and reproducer; Fig. 2 is an inverted plan view of the device; Fig. 3 is a longitudinal section on the line 3—3 of Fig. 1; Fig. 4 is a partial rear elevation of the sound box; Fig. 5 is a rear elevation of the lower portion of the device; Fig. 6 is a rear or inside elevation of the diaphragm and the means for securing it in place; Fig. 7 is an enlarged transverse section showing a bracket for securing a record cleaning brush or scraper to the sound box; Fig. 8 is an enlarged transverse section showing the needle grip; Fig. 9 is a perspective view showing a detail of the scraper-holding bracket; Fig. 10 is a perspective view showing a detail of the needle point grip; Fig. 11 is an enlarged transverse section showing the means of modified form for securing the stylus bar in the sound box; and Fig. 12 is a longitudinal section on the line 12—12 of Fig. 11.

Before proceeding to a more detailed explanation of my invention, it should be clearly understood, that while the same is particularly useful in connection with talking machines employing disk records, it can also be advantageously used with other and varied forms of talking machines. In changing the device from a recorder to a reproducer it is necessary, merely, to remove the recording point and to insert in place of it a reproducing point or needle. The recording point is essentially a cutting tool, for forming the undulating sound grooves in the wax of the master record, whereas the reproducer is a blunt or otherwise suitably

fashioned needle or point which merely follows the form of the grooves in the record and transmits its consequent vibrations to the diaphragm, which reproduces the sounds.

5 The degree of perfection attainable in the reproduction of sound waves as these are perpetuated upon a record depends to a large extent, upon the uniformity in width, pitch and smoothness of cut of the grooves formed
10 in the wax coating of the master plate or record by the sound-impelled recording tool or graver. I find, furthermore, that the movement of the stylus bar in a talking machine, if the bar is mounted upon pivotal points or
15 ball or knife-edged bearings and is held thereon resiliently, speedily effects a new centering of the contacting points, owing to the wearing of these points on their seats and the weakening of the springs, together
20 with the lateral and upward pressure due to the weight of the sound box carried by the point in engagement with the record. The supporting of the weight upon the reproducing point, moreover, is productive of irregular and ungoverned movements of the cutting
25 tool when the device is used as a recorder, while in the reproducer it results in the production of chattering, scraping, and metallic sounds. In other forms of talking
30 machines in which the stylus bar is secured to the casing through the movement of a plate spring placed horizontally and transversely with respect to the plane of the diaphragm, I find that the lateral pressure induces a torsional strain in the spring, materially
35 reducing its resiliency and tending to enlarge the opening in the diaphragm at which the stylus bar is secured, whereby the diaphragm is weakened and its attachment
40 to the stylus bar is eventually loosened. In these various forms of mounting the stylus bar in place, the circular or arc movements of the ends of the stylus bar are intensified and result in an unequal bearing of the
45 diaphragm upon its seat; consequently, where the connection between the stylus bar and the diaphragm is rigid, as when they are secured together by means of a screw and a plate, the arc or circular movements effect
50 a shifting of the diaphragm on its seat, and unless such movement is provided for, a binding or buckling of the diaphragm results, with the development of lines of flexion across its face.

55 Mica has long been considered among the most satisfactory of materials for talking machine diaphragms, but I find that with use, such diaphragms develop certain lines of weakness that very materially modify the
60 sounds reproduced. Furthermore, diaphragms as they are ordinarily mounted are tuned or keyed to certain predetermined ranges of notes within the limits of which the reproduction is good, but that when such
65 limits are exceeded there is an absence of

color tones, which renders the reproduction more or less harsh and unpleasant to the ear. In my device I provide a diaphragm which is attuned to a wide range of tones, by being
70 so mounted that it is sensitive not only to vibrations of the usual kind, but to impulses which will produce bodily movements of the diaphragm in its entirety. The stylus
75 bar which I have invented, is so formed that it transmits the impulses to the diaphragm at right angles to the plane of the same. The diaphragm is cushioned and its bodily
80 movements are thus resiliently resisted. It is furthermore, insensitive to foreign and undesirable impulses transmitted, for example, through the sound box casing and consisting
85 for instance, in the scraping sounds due to the contact of the needle point with the record.

I provide means for securing the needles
85 or reproducing points to the stylus bar at a uniform length, so that the leverage is always the same. Furthermore, the stylus bar of my invention is extensible and thus permits the adjustment of the leverage when
90 such adjustment is necessary or desirable.

I mount the stylus bar of my invention in such a manner that it is self-adjusting, cushioned, and highly responsive to slight
95 impulses. There is no metallic contact between the stylus bar and the sound box casing or between the cradle which supports the stylus bar, and the casing. It would seem that to secure constant and uniform
100 motion in the stylus bar and to effect elimination of the metallic sounds, all loose, movable contact of the parts must be avoided. Again, the scratching, scraping sound of the
105 needle in its passage over the sound grooves, while it cannot be eliminated, must be separated from the sounds to be reproduced, and must be prevented from entering the sound tube, if the sound issuing therefrom is to be improved.

It is of great importance that the movement of the cutting tool when recording,
110 and of the reproducing point, be hampered or hindered in no way whatsoever, and therefore, I have found it of advantage to support the weight of the sound box upon a
115 roller which engages the record, and which thus relieves the recording or reproducing point of this unnecessary weight. The roller is adjustable so that the sound box can be
120 raised or lowered as necessary, with respect to the record.

I have found that the volume of sound can be modified without the use of a special
125 needle, by simply shifting the sound box about its center, thereby changing the angle of the bearing of the needle on the face of the record, and further, such shifting or change in angle of bearing of the needle is an important feature in the proper operation
130 of the sound reproducer.

Referring more particularly to the drawings, I provide a preferably circular plate 15 which has a substantially central orifice, a cylindrical extension 16 encompassing the orifice and serving to attach the plate to a sound tube or other conduit for transmitting the sounds reproduced from the record. The cylindrical sound box casing 17 is arranged adjacent to the plate 15 at the side thereof remote from the extension 16, and is secured thereto by means of adjustable screws or studs 18 which extend through oppositely positioned slots 19 in the plate 15. The slots 19 constitute arcs of a circle having its center at the center of the plate, and thus permit the sound box to be rotated with respect to the plate. The latter has an arm or upward extension 20 provided with a nose 21 adapted to engage a series of teeth or indentations 21^a at the upper rim of the sound box to hold the same in position relative to the plate. The arm 20 has a stud 22 by means of which it can be conveniently manually operated. The sound box has a preferably ornamental knob or button 23 by means of which it can be grasped and adjusted. The sound box is open at the front, and near the open edge has an annular interior groove 24 in which is seated an annular cushion 25 preferably of circular cross section and fashioned from resilient material such as rubber or the like. A diaphragm ring 26 having an annular groove 27, encompassing the same, is arranged within the sound box and engages the cushion 25 at its groove 27. In this way the diaphragm ring is resiliently and movably mounted within the sound box. At the front, the diaphragm ring has an inwardly disposed annular flange 28 against which seats a retaining ring 29 having an inwardly disposed flange 30 at right angles thereto, and a second inwardly disposed flange 31 which is inclined at an angle with respect to the flange 30. A second, similar ring 29 is arranged opposite to the first ring with its flange 31 adjacent to the corresponding flange of the first ring. A diaphragm 32 is located between the retaining rings 29 and is clamped in place intermediate the flanges 31 of the retaining ring. An annular locking member 33 is located against the flange 30 of the inner retaining ring 29 and holds both these rings in place. The diaphragm ring at the inner edge has inwardly extending fingers 34 which engage the locking member 33 and hold the same in position. The retaining rings may be of rubber or other resilient material.

Arranged at the under side of the sound box casing is a cradle plate 35, curved to conform to the curvature of the wall of the sound box, and having interposed between it and the sound box a suitably formed resilient sheet 36, consisting preferably of soft

rubber or other cushion material. The cradle plate is secured in place by means of thumb-nuts or screws 37, having rubber or other cushion washers or buffers 38 separating them from the plate, the latter being provided with suitable openings for the passage therethrough of the thumb-nuts which enter suitably threaded openings of the sound box. A substantially V-shaped yoke 39, is positioned at the rear edge of the cradle plate 35, and has one arm 40 secured to the edge of the cradle plate by means of a pivot pin 41. The other arm 42, at the end has a slotted extension 43 which receives to the edge of the cradle plate by means of which the yoke can be secured in any one of a plurality of positions. Near the center, the yoke has a bearing 45 in which is journaled a roller 46 adapted to engage the record A to support the weight of the sound box. At the front edge, the cradle plate 35 has separated, substantially vertical arms 47, rigidly secured thereto or integral therewith. The arms have the lower ends inwardly disposed and slotted for a purpose which will appear hereinafter. The stylus bar is arranged between the arms 47 and includes an upper substantially cylindrical part 48 provided with a threaded opening 49 therethrough. The lower, substantially cylindrical portion 50 of the stylus bar, has a threaded stud 51 adapted to be adjustably received by the opening 49. The lower portion 50 of the stylus bar has a milled or burred flange or rim 52 by means of which it can be easily adjusted. It has further, at the lower end an opening or recess 53 to receive the recording or reproducing point or needle 54. At one side the portion 50 of the stylus bar is cut away to form a flat face 55 which is laterally extended. A pin 56 is pivoted upon the face 55 and has a slotted head 57 by means of which it can be adjusted. A flat, substantially helical, resilient member 58 is arranged upon the pin 56 and has rigid therewith an arm 59 secured in place by means of rivets 60 or in any other convenient manner. The member 58 has the end or part 61 free, so that in a predetermined position of the member 58 it projects over the opening 53 of the stylus bar to clamp or bind the needle or point in position within the opening 53. The arrangement is such that when the arm 59 is downwardly disposed a needle or point can be inserted freely in the opening 53. The arm 59 serves as a means for determining the distance to which the needle or point shall be inserted into the opening of the stylus bar, and it is thus possible to regulate the effective length of the stylus bar so that the latter remains uniform. By swinging the arm 59 upwardly the member 58 is turned to bring the part 61 over the opening 53 to clamp the point in place.

The stylus bar portion 48 has opposite, laterally extending wings 62 either rigidly secured thereto or integral therewith. At the ends, the wings are slotted and receive the extremities of strips 63 of resilient material such as spring metal or the like. The lower ends of the strips are secured in the slotted inwardly disposed ends of the arms 47. Rivets 64 or the like serve to hold the extremities of the strips in place. In this way the stylus bar is mounted upon the sound box so that it is free to swing in predetermined directions, while it is firmly held against upward, lateral, or torsional movements. The points of flexure of the strips can be determined by providing notches 65 in the sides thereof, which may be located where necessary or desirable. It will be understood that the stylus bar is freely movable in a plane at substantially right angles to the plane of the diaphragm, while it is held against movements in other planes.

The stylus bar portion 48 has an upwardly extending rigid stylus arm 66, preferably bifurcated and curving inwardly toward the center of the diaphragm 32. Near its upper end the sides of the stylus arm join to form a part 67 extending outwardly to a point remote from the diaphragm a distance greater than any other part of the arm. A further part 68 is disposed inwardly toward the diaphragm and is substantially parallel to the part 67, forming with the same, a narrow slot 69. The parts 67 and 68 are at normally right angles with respect to the diaphragm, the part 67 being more attenuated than 68, so that it can bend freely. The part 68 terminates in a substantially bell-shaped enlargement 70, having a flat face provided with a recess 71 and having, further, an opening 72 connected with the recess 71. The diaphragm 32 has a substantially central opening 73, through which passes a double, flexible member 74 consisting of an annealed copper wire or other suitable line. The flexible member extends through the recess 71 into the opening 72, and through further openings, to the outside of the enlargement 70, about which it is looped. A plate 75 is arranged at the side of the diaphragm remote from the stylus arm and has two converging openings 76 therethrough, each of which receives one run of the flexible member 74 and which terminate together at the opening 73 of the diaphragm. The runs of the member are twisted together at the outer side of the plate 75, to secure the latter, the diaphragm and the stylus arm, firmly though resiliently and flexibly together.

A bracket 77 fashioned from resilient metal or the like and having the ends 78 bifurcated, is mounted upon the rim of the sound box by means of the ends, which bind or grip the edge of the sound box. Inter-

mediate its ends, the bracket carries a clip 79. The clip has the sides provided with inwardly extending flanges 81, and at the bottom has a series of projections or ribs 82. The sides have portions cut away to form fingers 80, which are rearwardly disposed and curved to engage in suitable openings provided therefor in the bracket 77. One of the fingers 80 is longer than the other, whereby the clip can be mounted at an angle with respect to the bracket. A shank 83 is arranged slidably and adjustably within the clip and is held frictionally in place. At the lower end it is bifurcated and has arranged between the bifurcated parts a brush or scraper 84 fashioned from soft rubber or other material suited to the purpose. The scraper engages the record as the latter is rotated, in advance of the needle point, and thus cleans the record and removes dust or other foreign bodies which would tend to interfere with perfect contact between the needle point and the sound grooves. The shank is arranged at an acute angle, so that the engagement of the scraper with the record is at a similar angle to the line of rotation. The scraper also steadies the record while it is moving.

I prefer to form the diaphragm from a plate of mica, and a plate of like size and form, of a metallic foil cemented, under pressure, to the mica. If desired, a sheet of paper or similar material can be cemented intermediate the sheet of mica and the foil. I have found that a diaphragm of this construction, that is, of combined plates of mica and metal foil, or of mica, metal foil and paper, possesses superior resiliency and tonal qualities, and admits in its construction, of the utilization of a grade of material which has hitherto not been found suitable for this purpose.

In Figs. 11 and 12 is shown a means of modified form for mounting the stylus bar in position upon the sound box. In this form of the device I provide a block 85 having a threaded opening 86 therethrough adapted to receive the stud 51 of the lower stylus bar portion 50. The stylus arm 66 is rigid with the block 85. The latter has openings 87 and 88 therethrough at the upper and lower portions respectively. The openings 87 and 88 extend through the block from side to side, encompassing the central opening 86. At each side of the block are arranged tension plates 89 having inclined openings 90 therethrough. Lines or cords 91 are arranged in the openings 87, 88 and 90 and are crossed intermediate the block and the tension plates 89. The arms 47 have openings 92 through which the cords 91 pass. The latter are secured at the outer sides of the arms 47 by means of set screws 93. Adjusting screws 94 are arranged in suitable openings of the arms 47, and have

constricted ends 95 upon which are arranged tapered rubber jackets 96 engaging in correspondingly formed recesses 97 of the tension plates. In lieu of such jacketed screws I may cushion the recesses 97. The adjusting screws have the ends slotted and are provided with adjusting nuts 98 at the outside of the arms. By means of the adjusting screws the plates 89 can be moved away from the arms to spread the cords or lines to regulate the tension of the same. It will be understood that in this way the stylus bar is held so that it is free to move in a plane substantially at right angles to the plane of the diaphragm, but is firmly held against upward, lateral and torsional movements. The openings 90 of the tension plates are inclined toward the blocks 85, while the upper openings 88 of the latter are downwardly inclined.

The fact that the stylus bar comprises relatively movable parts 48 and 50 and can be lengthened or shortened by the adjustment of these parts permits the sound box to be used for the purpose of reproducing from and producing of sound records. When used for reproducing sounds it is desirable to have the greater length of the stylus bar between the fulcrum and the center of the diaphragm, to magnify the movements of the needle point when they are transmitted to the diaphragm. On the other hand, when the device is being used for making a record it is desirable to have the movements of the recording point relatively larger, and the stylus bar is then lengthened for this purpose, by screwing the part 50 in the proper direction. The latter part is free to move in the direction of its length as it has no connection with the sound box other than that through the part 48.

Having thus described my invention, I claim as new, and desire to secure by Letters Patent:

1. In a device of the class described, a sound-box, a ring therein, a diaphragm within said ring, and an annular member encircling said ring and serving to suspend and retain said ring movably within and out of contact with said sound-box, said member being fashioned from resilient material.

2. In a device of the class described, a sound box, a diaphragm ring within said sound box, a solid annular resilient member between said sound box and said ring and forming a cushion mount for said ring, retaining rings within said diaphragm ring, a diaphragm between said retaining rings, and means for holding said retaining rings clamped together to secure said diaphragm in place.

3. In a device of the class described, a substantially cylindrical sound box having an internal annular recess, a diaphragm ring within said sound box, and having an

annular recess, an annular member of resilient material engaging said recesses to mount said ring within said sound box and to permit a limited cushioned movement of said ring, and a diaphragm mounted to vibrate within said ring.

4. In a device of the class described, a sound box, a diaphragm ring within said sound box and having a cushioned engagement therewith whereby said ring has a limited bodily movement, said ring having an inwardly extending flange, a retaining ring within said diaphragm ring and resting against said flange, a second retaining ring within said diaphragm ring, said retaining rings having inclined flanges at the adjacent edges, a diaphragm arranged between said inclined flanges of said retaining rings, and a locking ring engaging one of said retaining rings to secure said retaining rings in position, said diaphragm ring having projections engaging said locking ring to secure the same in place.

5. In a device of the class described, a substantially cylindrical sound box having an internal annular recess, a diaphragm ring within said sound box and having an annular recess, an annular member of resilient material engaging said recesses to mount said ring within said sound box and to permit a limited cushioned movement of said ring, said ring having an inwardly extending flange, a retaining ring within said diaphragm ring and resting against said flange, a second retaining ring within said diaphragm ring, said retaining rings having inclined flanges at the adjacent edges, a diaphragm arranged between said inclined flanges of said retaining rings, and a locking ring engaging one of said retaining rings to secure said retaining rings in position, said diaphragm ring having projections engaging said locking ring to secure the same in place.

6. In a device of the class described, a plate having a substantially central opening, a sound box rotatable with respect to said plate and having an opening registering with said opening of said plate, a diaphragm within said sound box, a stylus bar carried by said sound box and controlling said diaphragm, said stylus bar being adapted to receive a recording or a reproducing needle, and a spring arm on said plate and engaging said box to hold the same in a plurality of positions with respect to said plate.

7. In a device of the class described, a plate having a substantially central opening, means for effecting communication between said opening and a sound tube, a cylindrical sound box adjacent to said plate, said plate at each side of its central opening having curved slots, studs projecting through said slots and rigid with said sound

box, said sound box having an opening adapted to register with said opening of said plate, said plate having an extension adapted to engage said sound box whereby the latter
5 can be held in a plurality of positions, a diaphragm within said sound box, and a stylus bar controlling said diaphragm.

8. In a device of the class described, a sound box, a diaphragm therein, a cradle
10 plate cushioned upon said sound box, arms rigid with said cradle plate, a stylus bar controlling said diaphragm, and flexible strips parallel to the plane of said diaphragm and connecting said stylus bar and
15 said arms.

9. In a device of the class described, a sound box, a diaphragm therein, a cradle plate cushioned upon said sound box, arms rigid with said cradle plate and having inwardly disposed portions provided with slots, a stylus bar having laterally extending wings provided with slots, and flexible strips having the ends secured in said slots respectively, of said wings and said arms.

10. In a device of the class described, a sound box, a diaphragm therein, a cradle secured to said sound box, a stylus bar controlling said diaphragm, and separate flexible strips connecting said stylus bar and said
30 cradle, said strips having sharply defined edge recesses medially located.

11. In a device of the class described, a sound box, a diaphragm therein, a stylus bar movably carried by said sound box and
35 controlling said diaphragm, a yoke pivoted upon said sound box and adjustable with respect thereto, a roller carried by said yoke and adapted to engage a record to support said sound box, and means for adjusting
40 said yoke.

12. In a device of the class described, a diaphragm, and a stylus bar in-curved toward said diaphragm and having at the end adjacent to said diaphragm a part extending outwardly therefrom, and a further part extending inwardly toward said diaphragm, said parts being substantially parallel and forming a narrow slot therebetween at substantially right angles to said diaphragm,
50 said parts in length exceeding the width of said slot.

13. In a device of the class described, a sound box, a diaphragm therein, and a stylus bar mounted upon said sound box and having
55 an arm incurved toward said diaphragm, said arm at the end adjacent to said diaphragm being outwardly and inwardly disposed whereby an outward extension is formed having a narrow slot therein, said outward extension extending to a point remote from said diaphragm a distance greater than any other part of said stylus bar, and exceeding in length the width of said slot.

14. In a device of the class described, a
65 stylus bar, a flexible member engaging said stylus bar, a diaphragm having an opening, said flexible member extending through said opening to the side of said diaphragm remote from said stylus bar, and means for
70 securing said flexible member at the side of said diaphragm remote from said stylus bar.

15. In a device of the class described, a diaphragm, a stylus bar having at the end adjacent to said diaphragm an extension,
75 said diaphragm having an opening there-through, a flexible member engaging said extension and passing through said opening of said diaphragm, and a plate at the side of said diaphragm remote from said
80 stylus bar and having openings there-through, said flexible member passing through said openings of said plate and being twisted to secure said plate, said diaphragm and said stylus bar together.

16. In a device of the class described, a stylus bar having an opening to receive a needle, and a face adjacent said opening, a helical member rotatably mounted upon said face and having a part adapted to project over said opening when said member is in a predetermined position, and an arm controlling said member.

17. In a device of the class described, a stylus bar having an opening adapted to
95 receive a needle, means for clamping the needle in said opening, and an arm controlling said clamping means, said arm, when said clamping means are inoperative, being arranged in a position such that it
100 constitutes a gage for determining the insertion of the needle into the opening of said stylus bar.

18. In a device of the class described, a stylus bar having an opening adapted to
105 receive a needle and provided with a flat face adjacent said opening, a pin rotatably mounted upon said face, a helical member loosely mounted upon said pin and having a part adapted to project over said opening to clamp the needle in place, and an arm controlling said member, said arm constituting a gage to determine the depth of insertion of the needle into said opening.

19. In a device of the class described, a
115 diaphragm comprising a sheet of mica, a sheet of metal foil, and a sheet of paper interposed therebetween, said sheets being cemented together under pressure.

20. In a device of the class described, a
120 sound box, a diaphragm ring therein, a solid annular cushion between said ring and said box, annular resilient members in said ring, said members having opposite flanges angularly positioned with respect to each other,
125 and a diaphragm held between said flanges.

21. In a device of the class described, a sound box, a diaphragm ring therein, an

annular member encompassing said ring and consisting of a solid, resilient material whereby said ring has a cushioned engagement with said box, annular resilient members in said ring, said members having opposite flanges angularly positioned with respect to each other and extending toward each other, and a diaphragm held between said flanges.

22. In a device of the class described, a rotatable sound box, means on said box whereby the same can be manually adjusted to positions for reproducing and recording, a diaphragm within the sound box, and a stylus bar controlling said diaphragm, said stylus bar being rotatively extensible below the fulcrum point thereof.

23. In a device of the class described, a sound box, a diaphragm therein, a stylus bar controlling said diaphragm and movably mounted on said box, said stylus bar having self contained means for providing

a greater leverage below than that above the fulcrum.

24. In a device of the class described, a sound box, a diaphragm therein, a stylus bar controlling said diaphragm, said stylus bar comprising a female section movably mounted on said box and fulcrumed thereon, said female section being inextensibly secured to said diaphragm, a male section in rotative engagement with said female section and operative therein to lengthen said stylus bar, said male section having means for holding a reproducing or recording needle.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM ALBERT CHAPMAN.

Witnesses:

J. E. MOORE,
L. H. KAISER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

A. E. SPENCER & F. C. THOMAS.
 MEANS FOR AUTOMATICALLY ARRESTING TALKING MACHINES.
 APPLICATION FILED NOV. 22, 1910.

998,807.

Patented July 25, 1911.

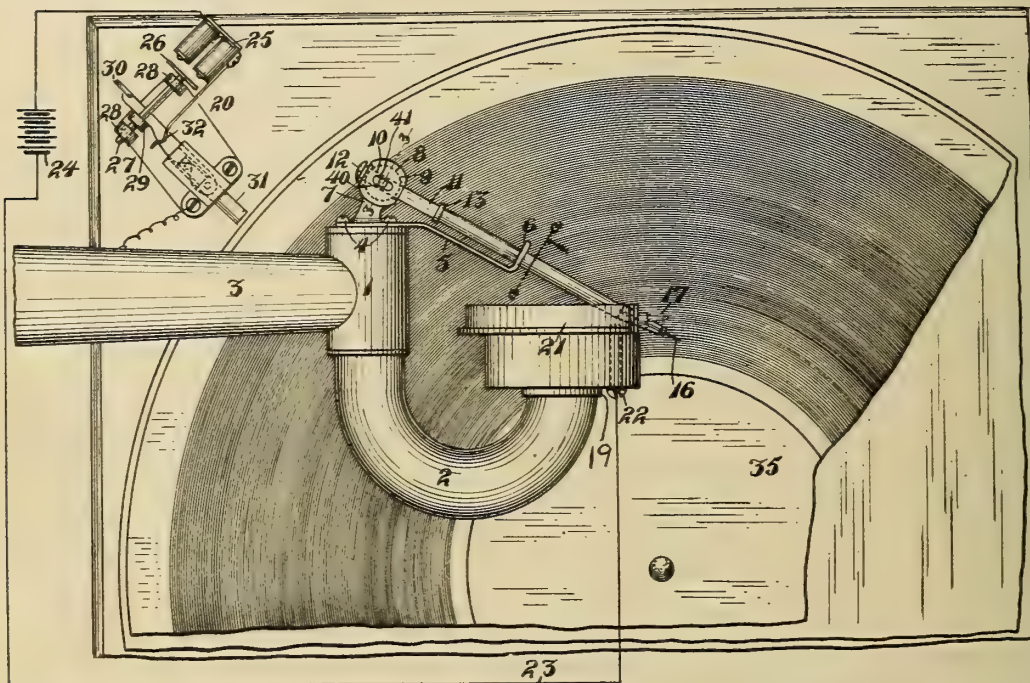


Fig. 1.

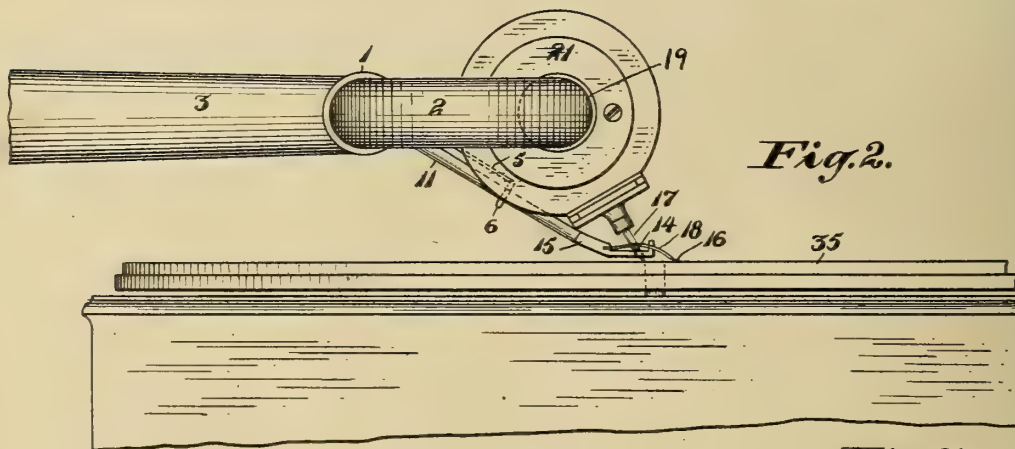


Fig. 2.

Fig. 4.



Fig. 5.



Fig. 6.



Fig. 3.



INVENTORS

A. E. Spencer
 F. C. Thomas

BY

John Wright
 ATTORNEY

WITNESSES:

J. C. Niedner
 W. B. Keating.

UNITED STATES PATENT OFFICE.

ARTHUR E. SPENCER, OF SAN FRANCISCO, AND FRANK C. THOMAS, OF MILL VALLEY, CALIFORNIA.

MEANS FOR AUTOMATICALLY ARRESTING TALKING-MACHINES.

998,807.

Specification of Letters Patent. Patented July 25, 1911.

Application filed November 22, 1910. Serial No. 593,636.

To all whom it may concern:

Be it known that we, ARTHUR E. SPENCER and FRANK C. THOMAS, citizens of the United States, residing, respectively, at San Francisco, in the county of San Francisco, and Mill Valley, in the county of Marin and State of California, have invented new and useful Improvements in Means for Automatically Arresting Talking-Machines, of which the following is a specification.

This invention relates to means for arresting the rotation of a talking machine automatically upon the stoppage of the sounds produced by the talking machine.

One object of the invention is to provide a device for accomplishing this and which will not necessitate any change in the form or construction of the record itself or in the mode of using the talking machine.

A further object is to provide such a device of a very simple construction.

In the accompanying drawing, Figure 1 is a broken plan view of a talking machine equipped with our invention; Fig. 2 is a broken side view thereof; Fig. 3 is a detail cross section on the line 3-3 of Fig. 1; Fig. 4 is a detail vertical section on the line a-a of Fig. 1; showing the positions of the parts when the tone tube is elevated; Fig. 5 is a similar view showing the positions of the parts when the tone tube is lowered to its operative position; Fig. 6 is a similar view showing the positions of the parts when the tone tube is also in the lower position but the pin has arrived at the end of the record.

Referring to the drawing, upon the thimble 1 which secures the tone tube 2 to the sound tube 3 is rigidly secured as by screws 4, an arm 5, from the end of which depends a loop 6. Also secured to said thimble is a small bracket 7, formed with a socket 8 in which can turn a ball 9, having a bearing 10 in which can slide a rod 11 the end of said rod having a head 12 and said rod having a collar 13. Said head and collar prevent the rod sliding out of its bearing 10. The rod is flattened where it passes through the bearing, so that it cannot turn therein, and the ball has a pin 14 in a slot 15 in the bracket to prevent the turning of the ball about an axis parallel with the rod. Said rod extends through the loop 6 suspended from the end of the arm 5, and its front or

lower end 15 is formed with a bearing 11 in which is secured a small piece of catgut 18 the lower end 16 of which preferably tapers to a fine point. Said bearing 11 is so formed that the catgut can easily be removed and a new piece inserted therein when necessary.

The loop 6 tapers toward the lower end, so that, when the tone tube is raised, the rod 11 passing through said loop 6, rests in said lower end thereof and when the stylus 17 of the talking machine is lowered on to the record 35, the end 16 of the catgut assumes a position slightly nearer the center of the record than the end of the stylus 17. When the catgut descends into contact with the record, it, and the rod 11, are supported by the record, 70 but the loop 6 can drop a short distance lower, so that the rod 11 no longer contacts with said loop, but assumes a position centrally thereof, as shown in Fig. 1. When the rod 11 no longer rests in the bottom of 75 the loop, the catgut would, but for the groove in the record, be shifted by the rotation of the record in a transverse or radial direction over the record, until the rod 11 assumed a tangential position with reference 80 to the circle described on the record by the lower end of the catgut, and before it arrived at this position the bearing 14 would contact with the stylus 17. But on account of the record being grooved, this result does 85 not take place, for the catgut is, by the weight of the rod 11, held in the sound producing spiral groove in the record into which it dropped, and, as before stated, is slightly nearer the center than the stylus 17, 90 and, in the rotation of the record, it is compelled to follow said groove always slightly within, or in advance of, the stylus. However, when the catgut arrives at the inner end of the spiral groove it no longer moves 95 in advance of the stylus, the cause of its so moving inward no longer existing. The stylus 17 continues to follow the spiral groove of the record, and, in the rotation of the record, approaches more and more 100 closely to the bearing 11 which holds the catgut, and eventually contacts with the same, and thus closes a circuit 20 which, on the side of the bearing 11, extends through the sound tube and the frame of the 105 machine, and on the side of the stylus, extends from the reproducer 21 to a screw 22 which is on the reproducer and thence by a

wire 23 to a galvanic cell 24 preferably contained in the box of the talking machine. Since as commonly constructed the reproducer 21 is supported upon the tone tube 2
 5 by an interposed sleeve 19 of rubber, the electric circuit is not closed by said tone tube. In this circuit is an electro-magnet 25 which attracts an armature 26 on a stem 27 sliding in bearings 28 and which carries a
 10 collar 29 adapted to actuate the lever 30 used at present to operate the brake 31 of the talking machine. When said lever is actuated, it breaks a contact in the circuit 20, consisting of said lever 30 and a bent wire 32
 15 secured to the electro-magnet. When the brake 31 is removed, said contact is again closed by the lever, and the circuit 20 is open at the stylus and catgut holder, and is adapted to be closed in the same manner as
 20 before. When the tone tube is raised for use with another record the arm 11 drops into the tapering lower end of the loop 6, and the holder is therefore out of electrical connection with the stylus, also said arm slides
 25 back in its bearing until the collar abuts against the bracket so that the catgut is out of the way when removing the stylus and replacing it by another.

We do not confine our invention to the arrangement here shown in which the stylus
 30 itself closes the electric circuit controlling the brake, as this electric circuit may be closed by contact of any parts moving respectively with the catgut on the one hand
 35 and the stylus on the other. Nor do we limit our invention to the means here shown for producing said relative motion, said means being the oblique arrangement of the rod 11
 40 to the arm carrying the stylus, as any positive means could be employed to produce this relative movement when permitted to

do so by the arrival of the catgut at the end of the spiral recording groove.

We claim:—

1. In combination with a rotating record 45 having a record groove, a talking machine having reproducing mechanism, a device engaging the groove in advance of the reproducing mechanism, an electric circuit, means movable respectively with said device and
 50 said reproducing mechanism and connected to opposite sides of said circuit to close the circuit by contact with each other due to a movement relative to one another of said
 55 reproducing mechanism and device, an electro-magnet in said circuit, and a brake for the record controlled by said electro-magnet, substantially as described.

2. In combination with a rotating record 60 having a record groove, a talking machine having reproducing mechanism, a holder carried by said talking machine, a filament carried by said holder and engaging the
 65 groove in advance of the reproducing mechanism, an electric circuit, means movable with said reproducing mechanism, said means and said holder being connected to opposite
 70 sides of said circuit to close the circuit by contact with each other due to a movement relative to one another of said reproducing mechanism and holder, an electro-magnet in said circuit, and a brake for the
 75 record controlled by said electro-magnet, substantially as described.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

A. E. SPENCER.
 F. C. THOMAS.

Witnesses:

FRANCIS M. WRIGHT,
 D. B. RICHARDS.

M. COUADE.
ARRANGEMENT FOR CONTINUOUS PHONOGRAPH RENDERINGS.
APPLICATION FILED MAR. 23, 1909.

999,097.

Patented July 25, 1911.

Fig. 1.

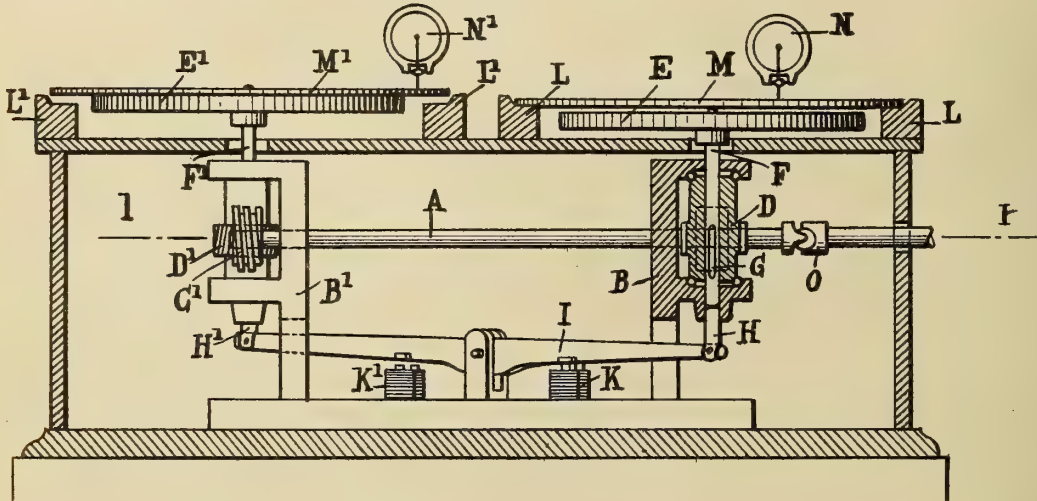


Fig. 2.

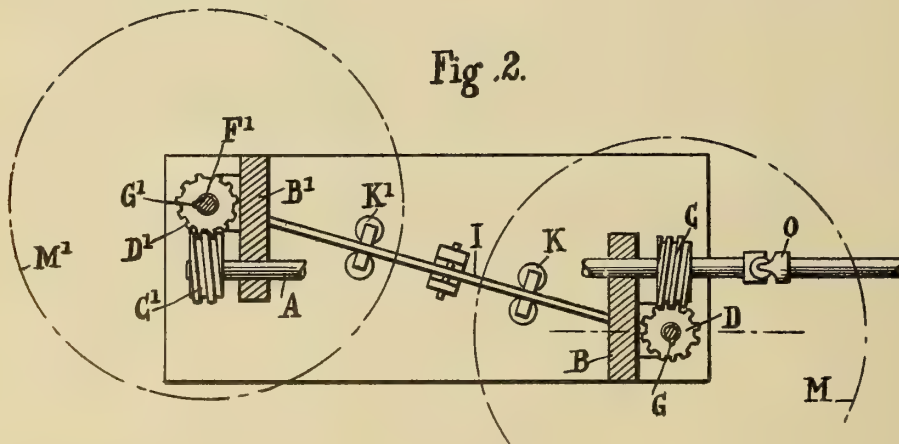
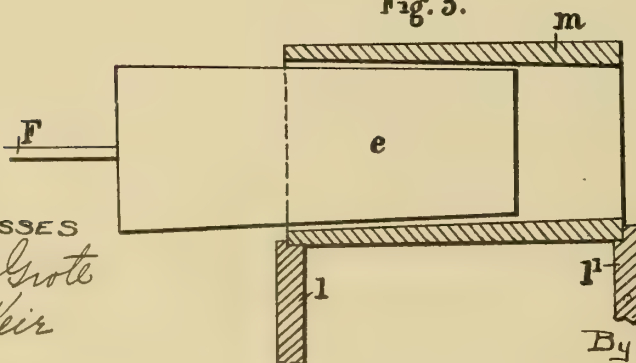


Fig. 3.



WITNESSES

L. H. Grote
W. E. Keir

INVENTOR

Maurice Couade

By *Amos H. Homan*
Attorneys

UNITED STATES PATENT OFFICE.

MAURICE COUADE, OF LAON, FRANCE.

ARRANGEMENT FOR CONTINUOUS PHONOGRAPH RENDERINGS.

999,097.

Specification of Letters Patent. Patented July 25, 1911.

Application filed March 23, 1909. Serial No. 485,225.

To all whom it may concern:

Be it known that I, MAURICE COUADE, a citizen of the French Republic, residing at Laon, Department of Aisne, France, have invented a new and useful Arrangement for Continuous Phonograph Renderings, of which the following is a full, clear, and exact description.

This invention relates to an arrangement whereby may be obtained the continuous rendering or reproduction of a piece of music or the like recorded on several successive disks or cylinders. This arrangement also enables me to effect as desired with absolute certainty and without jerks, the starting and the stopping of the gramophone or phonographic rendering of a piece, at any desired point in this piece and at a predetermined moment.

Means for carrying out the present invention are shown by way of example upon the annexed drawings, in which:—

Figure 1 is a longitudinal section, and Fig. 2 is a section on line 1—1 of Fig. 1. Fig. 3 shows an example of the arrangement applied to a cylinder apparatus.

A horizontal axis A turning between two supports or bearings B and B' transmits by the intermediary of two tangential screws C C' and two wheels D D', the movement of a constant speed-motor (not shown) to two plates E E'. The vertical spindles F F' of the plates can slide in the wheels which drive them, by means of keys G G'; by reason of this arrangement the wheels alone receive the oblique drive of the helicoidal gears and the vibrations from this wheel are not imparted to the plates E E'. These wheels D D' may be mounted between ball bearings carried by the bearings B B'.

The two tangential screws C C' have threads of opposite hands; the same applies to the wheels D D', the object being to balance the thrust of the wheels in the direction of the axis A.

The spindles F F' rest upon the extremities of two pistons H H' guided vertically in alinement with the spindles F F' and carried by the extremities of a beam I which can oscillate about a horizontal axis passing through its center, in the manner of a scale-beam. This beam is balanced under the weight of the two disks, even when the latter are in movement and a slight pressure upon one of the arms is sufficient to lower the corresponding disk while the other is

raised. This rocking is produced from a distance by the two small electro-magnets for the two directions.

Around each disk is fixed to the casing of the apparatus a crown L L' which serves as support to the disk at its edges, when the disk is lowered; it also allows of centering it in such a way that the hole in the disk is exactly facing the end of the disk-spindle and it maintains it at about a millimeter from the disk.

The working of the apparatus is as follows:—The motor being started and the excited electro-magnet K maintaining the plate E lowered, the disk M is laid upon the crown L and alined so that the needle of the reproducer N rests upon the point of the spiral which corresponds to the point at which the reproduction begins. At the moment when this reproduction is to begin, the pivoting of the beam is effected by the electro-magnet mechanism; as soon as the plate E in rising comes into contact with the disk M, it raises the latter from its support or seat L and revolves it in its own movement. The reproduction then begins immediately. During the reproduction of this first disk, the succeeding disk M' is placed upon the crown L', as before its reproducer N' being arranged at the point of the spiral at which the rendering is to begin. At the correct moment one changes over from the reproduction of the first disk M to that of the second disk M' by throwing over the beam. There happens in the case of the disk M' the same as described for the disk M, while the plate E in falling drops its disk M upon the crown L, which causes its instant stoppage. These operations are repeated. The adhesion of the disk to the plate which takes place over the lower surface of the disk and the adhesion to the crown which takes place at the edges of the disk are facilitated by the interposition of baize or any other substance preventing the slipping of the disk, as well as by the roughness of the lower surface of the disk. The plate E is made sufficiently heavy to prevent any disturbance in the speed of the motor owing to the sudden increase of weight added thereto by the comparatively light disk at the moment of engagement. The coincidence of the release of one disk with the engagement of the other has likewise for effect to avoid this disturbance in the speed.

The invention is not limited to the details

of construction given above merely by way of example. For instance the movement of the disks instead of being obtained through the rocking of a lever may be secured by any
 5 other suitable mechanical or electrical contrivance.

If it be desired to apply the arrangement to a cylinder apparatus, the plates E E' might for example be replaced by the conical sleeves employed in cylinder phonographs (*e* Fig. 3), and arrange the apparatus in such a way that the axes A F F' are horizontal.

The cylinders rest upon supports *l l'*
 15 which allow the cylinders to be centered; before the reproduction they sustain the cylinder, having its reproducer placed at a suitable point, at a very small distance from the sleeve.

20 The support *l* which is fixed will allow of detaching the cylinder at the moment of release; the support *l'* which is pivoted will allow of insuring the adhesion between the sleeve and the cylinder at the moment of engagement, and then by its pivoting or tilting action, which follows immediately, of releasing it completely.

Having thus described my invention, what I claim as such and desire to secure by Letters Patent is:—

30

1. A phonograph having stationary supports for two records, means for simultaneously lifting one record from and depositing another record upon its support and means in connection therewith for rotating only
 35 the lifted record for the purpose described.

2. A phonograph apparatus having stationary supports provided with means for centering records thereon, in combination with rotary supports adapted to lift the
 40 records from said stationary supports and means for imparting vertical movement in opposite directions to said rotary supports whereby a record may be lifted from one stationary support while another record
 45 is deposited on the other stationary support, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses.

MAURICE COUADE.

Witnesses:

CHARLES DOUY,
 JULES DEVINE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."



B. F. PHILPOT.
MOLDING MACHINE FOR CYLINDRICAL PHONOGRAMS.
APPLICATION FILED FEB. 12, 1910.

999,183.

Patented July 25, 1911.

Fig. 1.

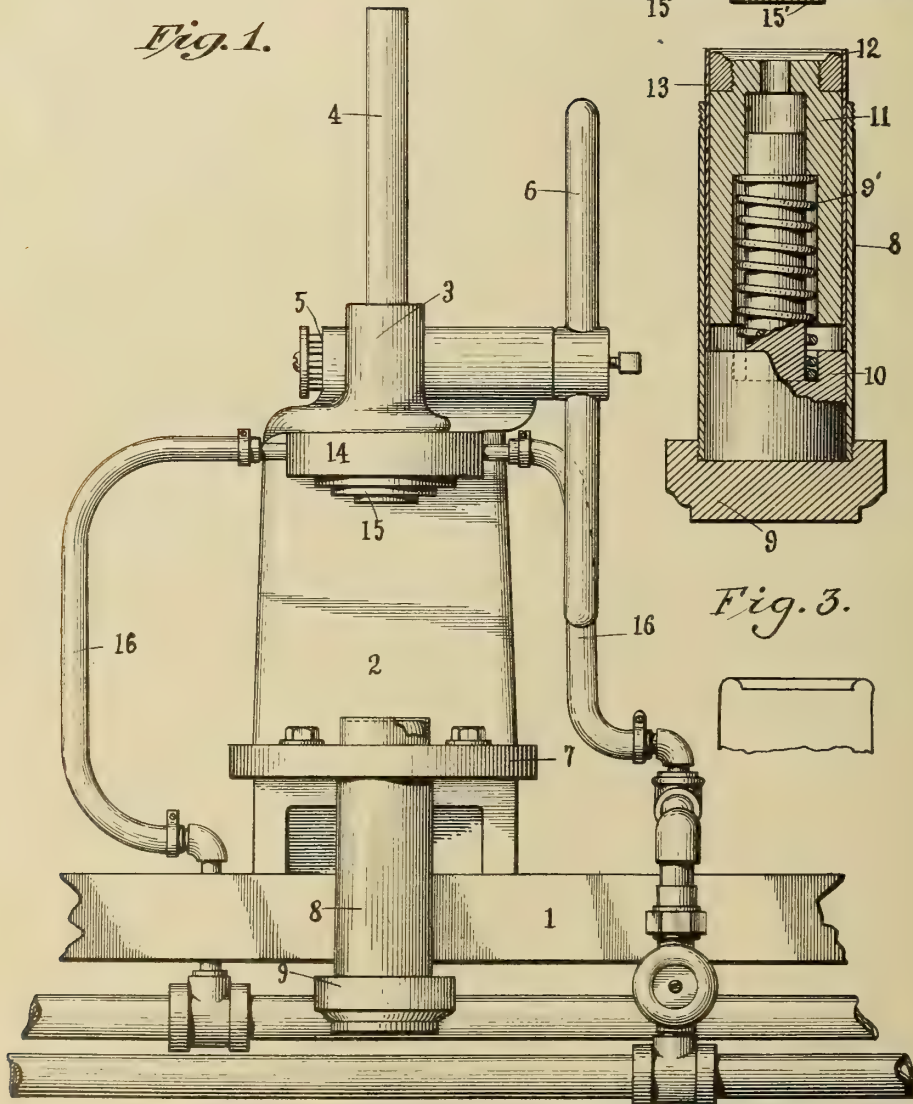


Fig. 2.

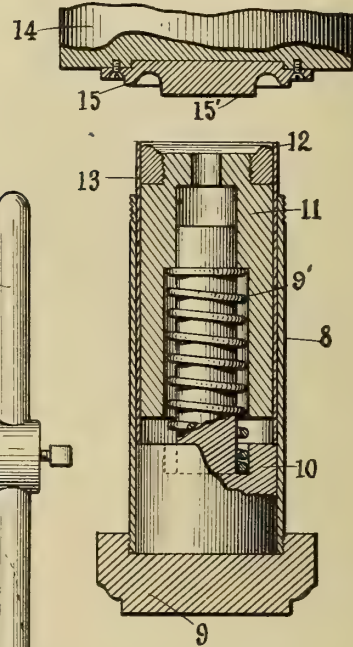
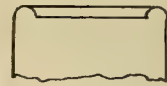


Fig. 3.



Attest:
W. Mitchell
Bertha J. Fuchs

Brian F. Philpot, Inventor:

by *Robt B. Killgore*
Atty

UNITED STATES PATENT OFFICE.

BRIAN F. PHILPOT, OF BROOKLYN, NEW YORK.

MOLDING-MACHINE FOR CYLINDRICAL PHONOGRAMS.

999,183.

Specification of Letters Patent.

Patented July 25, 1911.

Application filed February 12, 1910. Serial No. 543,530.

To all whom it may concern:

Be it known that I, BRIAN F. PHILPOT, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Molding-Machines for Cylindrical Phonograms, of which the following is a specification.

My invention relates to improvements in machines or molding presses for turning in the ends of tubes or cylinders used in making phonograms in accordance with the process disclosed in my application Ser. No. 543,529 filed February 12th, 1910.

My object is the production of a press which will support the extremely thin walls of the tube and smoothly turn the ends in between the dies which are maintained at a pre-determined distance apart while the molding operation is being carried on.

In the drawing Figure 1 is a view of the complete machine, Fig. 2 is a sectional view of the tube holder and molding cap or die, and Fig. 3 shows the end of the tube after it has been turned in.

The machine comprises a base 1 provided with a bearing standard 2 having a bearing box 3 at the upper part. A plunger 4 is actuated by a gear 5 working in a rack on the plunger and reciprocates in the bearing 3, a handle 6 connected with the gear affording means for reciprocating the plunger. A shelf 7 carries the work holding cylinder 8 which is provided with a base 9. The shelf is far enough below the head of the machine to enable the tubes to be slipped in and out of the cylinder. The inside diameter of this cylinder is slightly larger than the outside of the tube to be molded. A mandrel rests inside this cylinder and its outside diameter is slightly less than the inside diameter of the tube being molded. This mandrel consists of a differential plug 10 resting on the base 9 and has a spring 9' wound around its small diameter. A second plug member 11 rests on the spring and is centered on the small diameter of the plug 10. The upper end of this plug 11 is beaded or rounded to form a male die which may be a separate piece as shown to facilitate renewals. The heating head 14 is attached to the plunger 4 and flexible piping 16 affords means for conveying steam for keeping the head hot. A female die 15 is secured to the head 14 and coöperates with the male die 12.

A tube of the material to be molded is slipped into the cylinder with its upper edge slightly showing above the top as shown in Fig. 2. On lowering the heated head and die the central part 15' of the female die strikes the spring supported part 11 of the compound mandrel and causes it to telescope against the pressure of the spring.

The thickness of the central boss 15' determines the space between the operative faces of the dies which should be a few thousandths of an inch more than the thickness of the material being operated upon to enable it to slip freely between the dies and be rolled in and yet prevent wrinkling. The exposed edge of the tube strikes against the flare on the outside of the female die 15 and begins to curl inward over the edge of the male die. On further downward motion of the head the upper part of the mandrel continues to sink and the upper edge of the tube 13 is rolled smoothly between the dies. As the sides of the tube are at all times fully supported between the mandrel and cylinder they have no chance to warp, twist or wrinkle. After the limit of travel is reached the head is raised, the spring lifting the upper member of the mandrel and the tube with its rolled over edge can be removed from the machine.

I claim:—

1. A molding machine for making cylindrical phonogram blanks of celluloid or the like material comprising a frame, tube holding mechanism a die secured to the tube holding mechanism, a heated head movably secured to the frame, a counter die on the head and means for maintaining a predetermined separation between the operative faces of the dies while they are in molding position.

2. A molding machine for making cylindrical phonogram blanks of celluloid or the like material comprising a frame, a cylinder secured thereto, a compound mandrel within the cylinder, the upper member of which is yieldingly supported, a die on the upper member, a heated head, a counter die carried thereon, means for reciprocating said head with respect to the cylinder whereby the material to be molded will be forced between the dies upon the reciprocation of the head, and means for maintaining a predetermined separation between the operative faces of the dies while they are in molding position.

3. A molding machine for making cylin

drical phonogram blanks of celluloid or the like material comprising a heated head, a die on said head, means for reciprocating said head, a work holding member alined
 5 with said head consisting of a cylinder, a compound mandrel within said cylinder composed of an upper part which telescopes with respect to the cylinder, and a lower supporting part, the cylinder and mandrel
 10 being adapted to hold the tube to be operated upon between them, a counter die on the upper member of the mandrel and means for maintaining a pre-determined separation between the operative faces of
 15 the dies while they are in molding position.

4. A molding machine for making cylindrical phonogram blanks of celluloid or the like material comprising a heated head, a die on said head, means for reciprocating
 20 said head, a work holding member alining with said head consisting of a cylinder, a compound mandrel within said cylinder composed of a lower part of different diameters, a spring on the small diameter, an
 25 upper part guided by the small diameter and resting on the spring, and a counter die on the spring supported member, the cylinder and mandrel being adapted to hold the tube to be operated upon between them; and

means for maintaining a pre-determined 30 separation between the operative faces of the dies when they are in molding position.

5. A molding machine for making cylindrical phonogram blanks of celluloid or the like material comprising a heated head, a
 35 die on said head, means for reciprocating said head, a work holding cylinder rigidly supported in alinement with said head, a compound mandrel in said cylinder consisting of an upper and a lower member, the
 40 upper member of which telescopes with respect to the cylinder means for yieldingly supporting the upper member, a counter die on the upper member, the cylinder and mandrel being so proportioned that the tube
 45 to be operated upon will fit snugly between the cylinder and mandrel and project above the top of the cylinder and slightly above the face of the die, and means for
 50 maintaining a pre-determined separation between the operative faces of the dies when they are in molding position.

In testimony whereof I have affixed my signature in presence of two witnesses.

BRIAN F. PHILPOT.

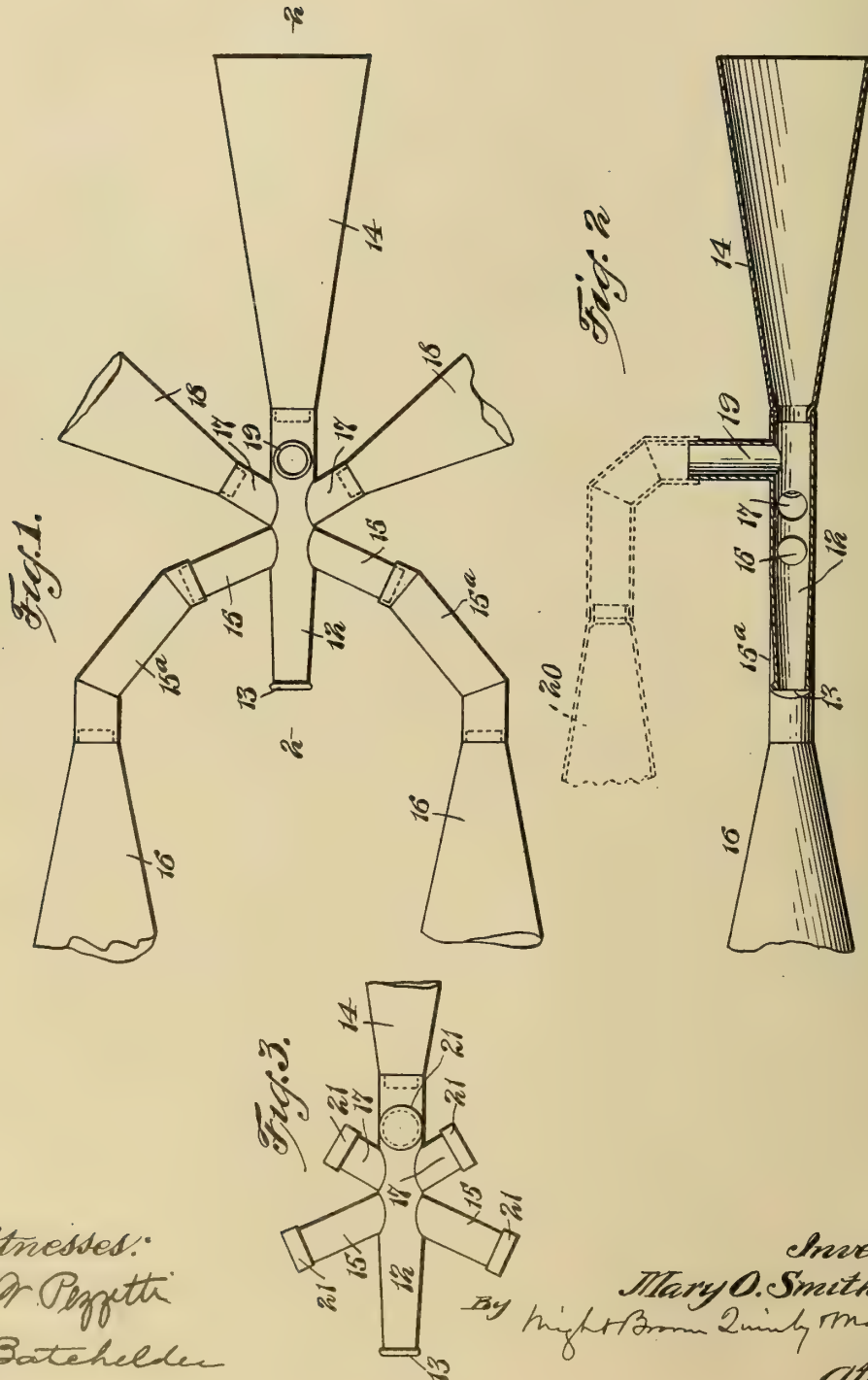
Witnesses:

ROBT. B. KILLGORE,

A. J. MANTRED.

999,408.

Patented Aug. 1, 1911.



Witnesses:
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E. Batchelder

Inventor:
Mary O. Smith;
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Attys.

UNITED STATES PATENT OFFICE.

MARY O. SMITH, OF AUBURN, MAINE.

MEGAPHONE.

999,408.

Specification of Letters Patent.

Patented Aug. 1, 1911.

Application filed March 31, 1910. Serial No. 552,666.

To all whom it may concern:

Be it known that I, MARY O. SMITH, of Auburn, in the county of Androscoggin and State of Maine, have invented certain new and useful Improvements in Megaphones, of which the following is a specification.

This invention has for its object to provide a megaphone adapted to direct sound waves, not only in a forward direction from the operator, but also in a rearward direction, so that sound vibrations transmitted through the megaphone may be heard equally well by persons behind and in front of the operator.

The invention is embodied in a megaphone comprising a trunk tube having a mouth piece into which the operator speaks, a forwardly facing horn adapted to direct sound waves forward from the operator, and a rearwardly extending branch tube which is offset from the trunk tube and is adapted to extend across the operator's head or neck, and terminates in a rearwardly facing horn.

The invention may also be embodied in a megaphone characterized as above stated and further characterized by additional branch tubes and sound delivering horns adapted to direct sound waves laterally or toward the right and left of the operator.

Of the accompanying drawings forming a part of the specification,—Figure 1 represents a plan view of a megaphone embodying my invention. Fig. 2 represents a section on line 2—2 of Fig. 1. Fig. 3 represents a view similar to Fig. 1 showing the sound delivering horn removed from the branch tubes, the latter being closed by detachable caps.

The same reference characters refer to the same parts in all the figures.

In the drawings, 12 represents a trunk tube having at one end a mouth piece 13 adapted to be applied to the mouth of the speaker, the trunk tube 12 being adapted to conduct sound waves from the mouth piece.

14 represents a sound delivering horn which is preferably of tapering form as shown in the drawings, said horn facing forwardly so that it is adapted to direct sound waves forward from the speaker.

15 represents a branch tube which projects from the trunk tube 12, and projects rearwardly and terminates in a rearwardly facing sound delivering horn 16. The form and arrangement of the branch tube 15 and

horn 16 are such that the horn is offset from the trunk tube and is adapted to extend across the operator's head or neck so that sound waves may be directed backwardly from the operator by the horn 16. The branch tube 15 and its horn 16 may be arranged to be supported by a shoulder of the operator, although if only one of said branch tubes is employed it is obvious that the tube 15 and horn 16, instead of being supported by the operator's shoulder, may extend over the top of the operator's head.

As shown in Fig. 1, there are two of the tubes 15 and rearwardly facing horns 16, these being located at opposite sides of the trunk tube 12, so that when the device is in use the two branch tubes 15 and their horns may be supported by the shoulders of the operator.

17 represents laterally projecting branch tubes terminating in horns 18, 18, said branch tubes and horns being arranged to deliver sound waves laterally toward the right and left of the operator. 19 represents another branch tube which may be employed in connection with the two branch tubes 15 and is arranged to extend upwardly and backwardly over the top of the operator's head, said branch tube 19 terminating in a rearwardly facing horn 20.

It will be seen from the foregoing that provision is made for directing sound waves simultaneously forward, backward, and laterally from the operator, so that persons behind and at either side of the operator may hear with the same facility as those located in front of the operator.

In Fig. 3 I have shown the horn distinct from all the branch tubes, the latter being closed by removable caps 21 so that sound waves are directed only by the forwardly facing horn 14.

It is obvious that the horn 14 may be detachably connected with the trunk tube to enable the megaphone to occupy a small space when packed.

The branch tubes 15 include elbow shaped extensions 15^a, the outer members of which are substantially parallel with the trunk tube 12. The said extensions may be rotatable on the body or inner portions of the branch tubes 15, so that the extensions and the horn carried thereby may be extended at different angles and direct the sound waves either horizontally or at any desired angle.

The various sound-delivering horns may be of telescopic construction for the sake of compactness in packing, but as telescopic horns are common and well known, I do not deem it necessary to illustrate a telescopic construction.

I do not limit myself as to the number of branch tubes and horns, and as already stated, I may employ either one or more rearwardly extending branches and rearwardly facing horns. If desired, the laterally extending branches 17 and horns 18 may be omitted, or only one of these branches and accompanying horns may be provided.

The forwardly facing horn 14 may be removed and the outer end of the trunk tube closed by a cap 21, to enable all the sound waves to be directed through one or more of the branches should this be desirable.

The device being a megaphone is of course portable and, like megaphones in general, is intended to limit the transmission of the sound waves to substantially horizontal directions. Owing to the fact that there is one sound receiving branch and a plurality of sound distributing branches, all of which are rigidly connected and extend in different horizontal directions, the device is especially adapted for distributing the voice of a speaker who may stand within an audi-

torium or a race-track or ball-field, or wherever announcements are to be made in connection with athletic sports. The device enables the speaker to make himself heard equally well by people scattered in various directions. If the audience is not extensively distributed, the user can remove one or more of the delivering horns 14, 16 and 18, and apply caps to the tubes from which the horns were removed, thereby readily converting the device to the form best adapted for the particular audience to receive the announcements.

I claim:—

A megaphone comprising a trunk tube provided with a mouth piece at one end, a sound delivering horn at the other end, and intermediate branch tubes, elbow extensions rotatably secured to said branch tubes, the outer members of said extensions being normally parallel with said trunk tube, and sound delivery horns connected to said outer members and adapted to rest upon the shoulders of the operator to balance the megaphone and aid in supporting the latter.

In testimony whereof I have affixed my signature, in presence of two witnesses.

MARY O. SMITH.

Witnesses:

DAWN B. JEFFERY,
FOREST E. LUDDEN.



C. O. HAYS.
PHONOGRAPH.

APPLICATION FILED SEPT. 1, 1910.

Patented Aug. 1, 1911.

2 SHEETS—SHEET 1.

999,645.

Fig. 1.

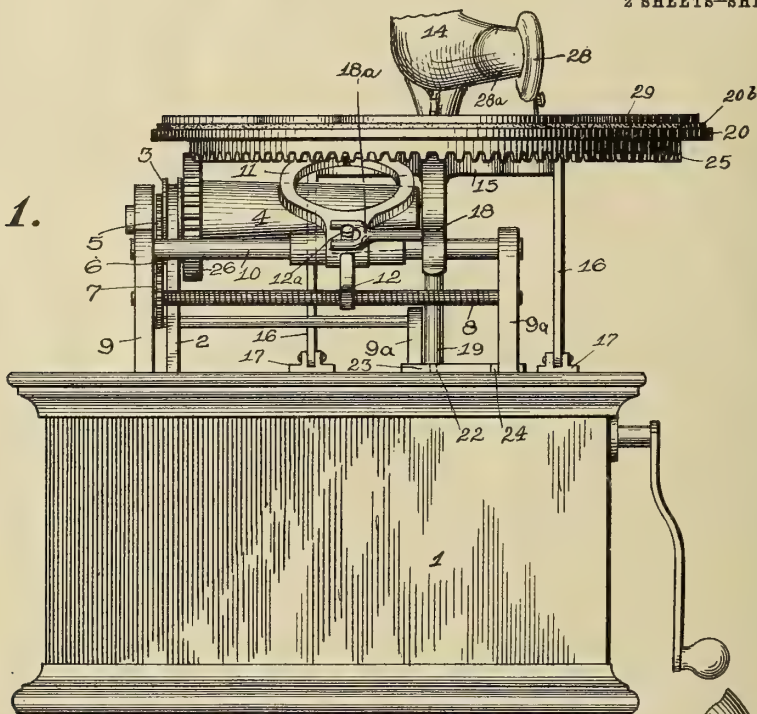
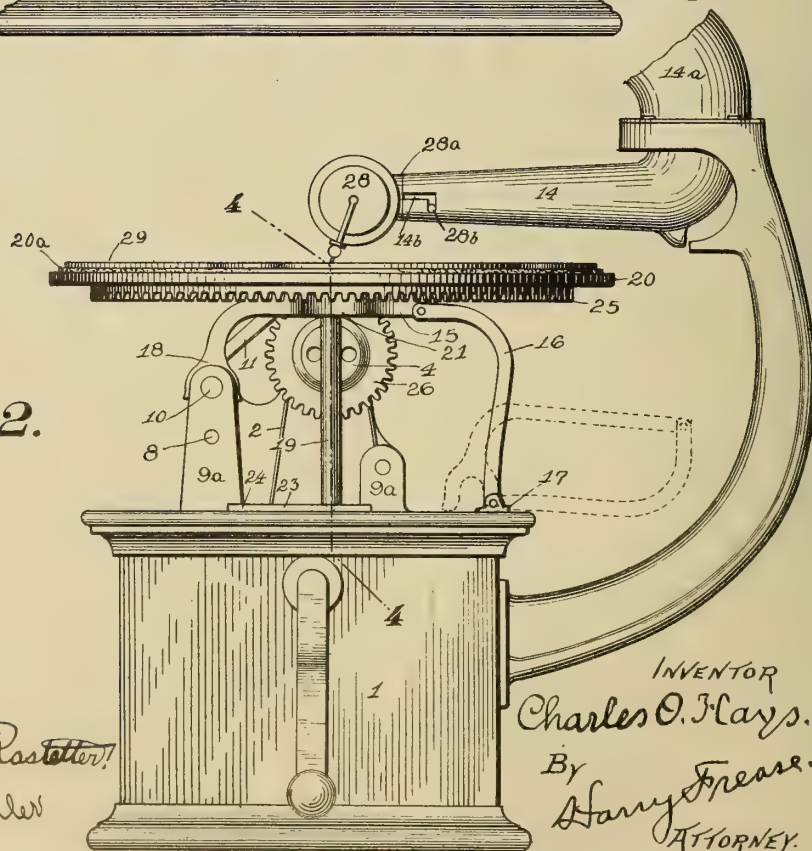


Fig. 2.



WITNESSES.

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PHONOGRAPH.

APPLICATION FILED SEPT. 1, 1910.

999,645.

Patented Aug. 1, 1911.

2 SHEETS—SHEET 2.

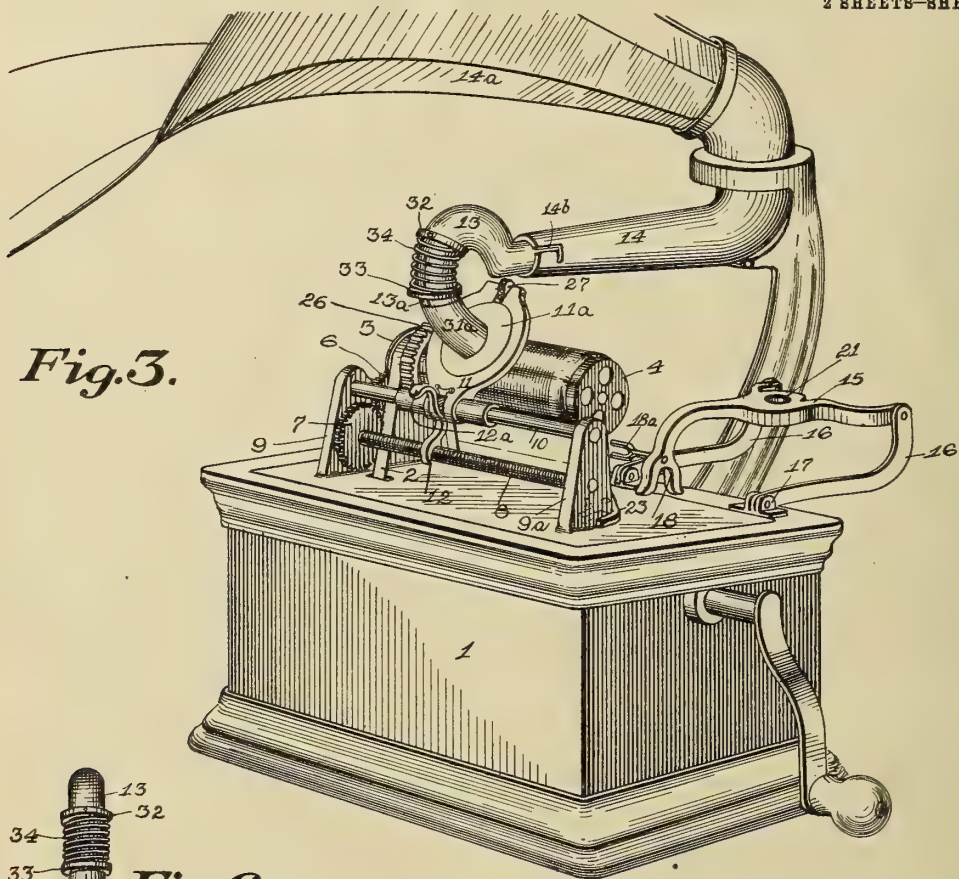


Fig. 3.

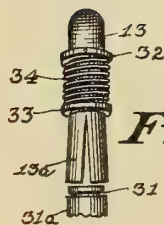


Fig. 6.

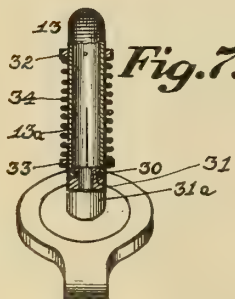


Fig. 7.

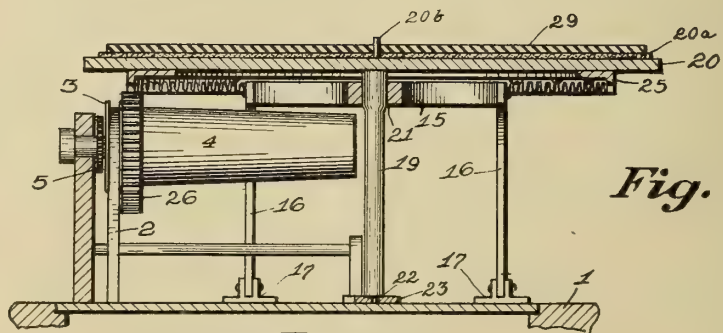


Fig. 4.

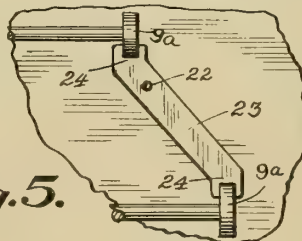


Fig. 5.

WITNESSES.

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ATTORNEY.

UNITED STATES PATENT OFFICE.

CHARLES O. HAYS, OF LOCUST CORNER, OHIO.

PHONOGRAPH.

999,645.

Specification of Letters Patent.

Patented Aug. 1, 1911.

Application filed September 1, 1910. Serial No. 580,107.

To all whom it may concern:

Be it known that I, CHARLES O. HAYS, a citizen of the United States, residing at Locust Corner, in the county of Clermont and State of Ohio, have invented certain new and useful Improvements in Phonographs, of which the following is a specification.

The invention relates to attachments for phonographs by means of which both disk and cylinder records can be used on cylinder machines. By the use of these devices both styles of records can be played with equal convenience and very little time is required to make the change when the alternate style is desired.

The playing of disk records is accomplished by the use of a jointed bracket which is adapted to support a disk turn-table, suitable gearing to impart motion from the phonograph driving mechanism to the turn-table and a disk record reproducer which can readily be interchanged with the cylinder record reproducer. But, when cylinder records are to be used, the turn-table is removed and the jointed bracket is folded back out of the way.

A preferred form of the invention is illustrated in the accompanying drawings, forming part hereof, in which—

Figure 1 is a front view of a cylinder phonograph, showing the devices in use with a disk record; Fig. 2, an end view of the same, showing the jointed bracket in its prone position in dotted lines; Fig. 3, a perspective view showing the machine in use with a cylinder record; Fig. 4, a section on line 4-4, Fig. 2; Fig. 5, a top view of a portion of the base of the phonograph; Fig. 6, a view of the goose-neck, showing the split tube, forming part thereof, in the position to withdraw the reproducer; and Fig. 7, a similar view, with parts broken away, showing the goose-neck connected to the reproducer.

Similar numerals refer to similar parts throughout the drawings.

The phonograph shown in the drawings is of common construction. The casing 1 contains the driving mechanism, not shown,

which, by means of the belt 2 over the pulley 3, rotates the cylinder-record-mandrel 4. On the same shaft with the pulley 3 is fixed the spur gear 5, which meshes with the idler 6, which in turn rotates the spur gear 7. The spur gear 7 is fixed to the worm 8, which is journaled in the brackets 9 and 9^a. The guide bar 10 is also supported by the brackets 9 and 9^a, and thereon is slidably mounted the reproducer frame 11, to the lower part of which is attached the nut 12, which meshes with the worm 8. Thus, when the worm screw is turned, the reproducer moves parallel to the axis of the mandrel.

When a cylinder record is operated on the mandrel, the reproducer needle (not shown) is vibrated by its contact with the revolving record and sound waves are produced in the reproducer 11^a from whence they are conveyed through the goose-neck 13 and the tone-arm 14 to the horn 14^a. The nut 12 can be thrown open or out of engagement with the worm and the reproducer needle raised from the record, by slightly raising the controlling-lever 12^a, thus simultaneously stopping the endwise movement of the reproducer frame and the playing of the record; all of which is old and forms no part of the invention.

For the purpose of playing disk records a jointed bracket is employed, which includes the bearing frame 15 which is jointed to the bars 16, which are hinged to the casing by the pivoted supports 17. On the front of the bearing frame is formed or connected the bifurcated foot 18, which is adapted to straddle the guide bar 10 and thus hold the jointed bracket in a rigid and elevated position.

If it is desired to play cylinder records, the jointed bracket is folded back out of the way, as shown in Fig. 3; but, if disk records are to be played, it is brought upward and forward into an elevated position, and the foot 18 is engaged on the guide bar 10. Then the reproducer is moved toward the jointed bracket by lifting the lever 12^a, which keeps the reproducer out of action, and said lever is held out of action by placing it over the pin 18^a, which is connected to the foot 18.

Then the shaft 19, to which is axially fixed the turn-table 20, is inserted through the bearing 21 in the bearing frame, and the lower end of the shaft is journaled in the step bearing 22 which is formed in the plate 23. This plate is formed as shown in Fig. 5, and its notched ends 24 embrace the brackets 9^a, which prevent any lateral movement.

Rotary motion is communicated to the turn-table 20 from the mandrel 4 by suitable gearing, the preferred form of which is illustrated. On the under side of the turn-table is located the crown wheel 25 which engages the spur gear 26, which fits snugly on the large end of the mandrel. It will be seen that when the mandrel rotates, the gears 25 and 26 will impart motion to the turn-table.

Even though the jointed bracket is not held firmly in position, or if it should be slightly out of its proper position, the spur gear 26, on account of its wide face, will make allowance of any such irregularity and will mesh with the teeth of the crown wheel just the same. The size of these gears is preferably made such, that the two styles of records can be played at substantially the same speed, thus making it unnecessary to change the speed adjustment.

By turning the thumb screw 27 the cylinder reproducer 11^a can be removed from its frame, and the goose-neck 13 is then free to be withdrawn from the tone-arm. The disk reproducer 28 is then firmly connected to the tone-arm by inserting its tubular shank 28^a into the tone-arm and engaging the pin 28^b on the shank in the L-shaped slot 14^b in the tone-arm.

There is preferably a pivotal connection between the goose-neck and the cylinder reproducer and it is sometimes desirable to remove only the goose-neck from the machine, and therefore it is made detachable from the reproducer. This connection is shown in Figs. 6 and 7. The split tube 13^a of the goose-neck is provided with an internal annular rib 30 which fits loosely in the annular groove 31 in the tube 31^a of the reproducer. On the goose-neck are located the fixed collar 32, the loose collar 33 and the intervening coiled spring 34, which is normally expanded, and its respective ends are attached to the collars. When the spring is compressed by sliding the loose collar upward the split tube 13^a is free to expand and the reproducer can be detached as shown in Fig. 6. On the turn-table is the usual covering of felt 20^a and the centering pin 20^b, on which can be placed the disk record 29.

When these preparations are made, the machine is ready to be started and it is operated in the usual manner. It is obvious that no skill is required and but little time is consumed in changing from one style rec-

ord to another. Furthermore, the device can very easily be applied to any machine without requiring it to be sent to the factory. And it is evident that the use of the step bearing is not essential, although the same is preferred because its use renders unnecessary the making of the jointed bracket and its connections strong enough and the bearing therein large enough to hold the axial shaft of the disk table without a step bearing.

I claim:

1. A phonograph including a case with a step-bearing, a cylinder-record mandrel and a reproducer having a controlling lever thereon; a normally-folded bracket having a bearing therein on the case and adapted to be secured in an elevated position; a disk-record table having an axial shaft adapted to be inserted in the bracket-bearing and step-bearing when the bracket is elevated, there being an arm on the bracket adapted to hold the cylinder-reproducer controlling-lever out of action when the bracket is elevated; and gearing connections between the mandrel and the table.

2. A phonograph including a case with a cylinder-record mandrel and a reproducer having a controlling lever thereon; a normally-folded bracket having a bearing therein on the case and adapted to be secured in an elevated position; a disk-record table having an axial shaft adapted to be inserted in the bracket-bearing when the bracket is elevated, there being an arm on the bracket adapted to hold the cylinder-reproducer controlling-lever out of action when the bracket is elevated; and gearing connections between the mandrel and the table.

3. A phonograph including a case with a step-bearing and a cylinder-record mandrel thereon, a normally-folded jointed bracket having a bearing therein hinged to the case and adapted to be secured in an elevated position, a disk-record table having an axial shaft adapted to be inserted in the bracket-bearing and step-bearing when the bracket is elevated, and a gearing connection between the mandrel and the table.

4. A phonograph including a case with a cylinder-record mandrel thereon, a normally-folded jointed bracket having a bearing therein hinged to the case and adapted to be secured in an elevated position, a disk-record table having an axial shaft adapted to be inserted in the bracket-bearing when the bracket is elevated, and a gearing connection between the mandrel and the table.

5. A phonograph including a case with a step-bearing thereon, a normally-folded jointed bracket having a bearing therein hinged to the case and adapted to be secured in an elevated position, and a table having

an axial shaft adapted to be inserted in the bracket-bearing and step-bearing when the bracket is elevated.

5 6. A phonograph including a case, a normally-folded jointed bracket having a bearing therein hinged to the case and adapted to be secured in an elevated position, and a

table having an axial shaft adapted to be inserted in the bracket-bearing when the bracket is elevated.

CHARLES O. HAYS.

Witnesses:

DOAN BEELER,
AMANDA KEARNS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."



C. O. HAYS.

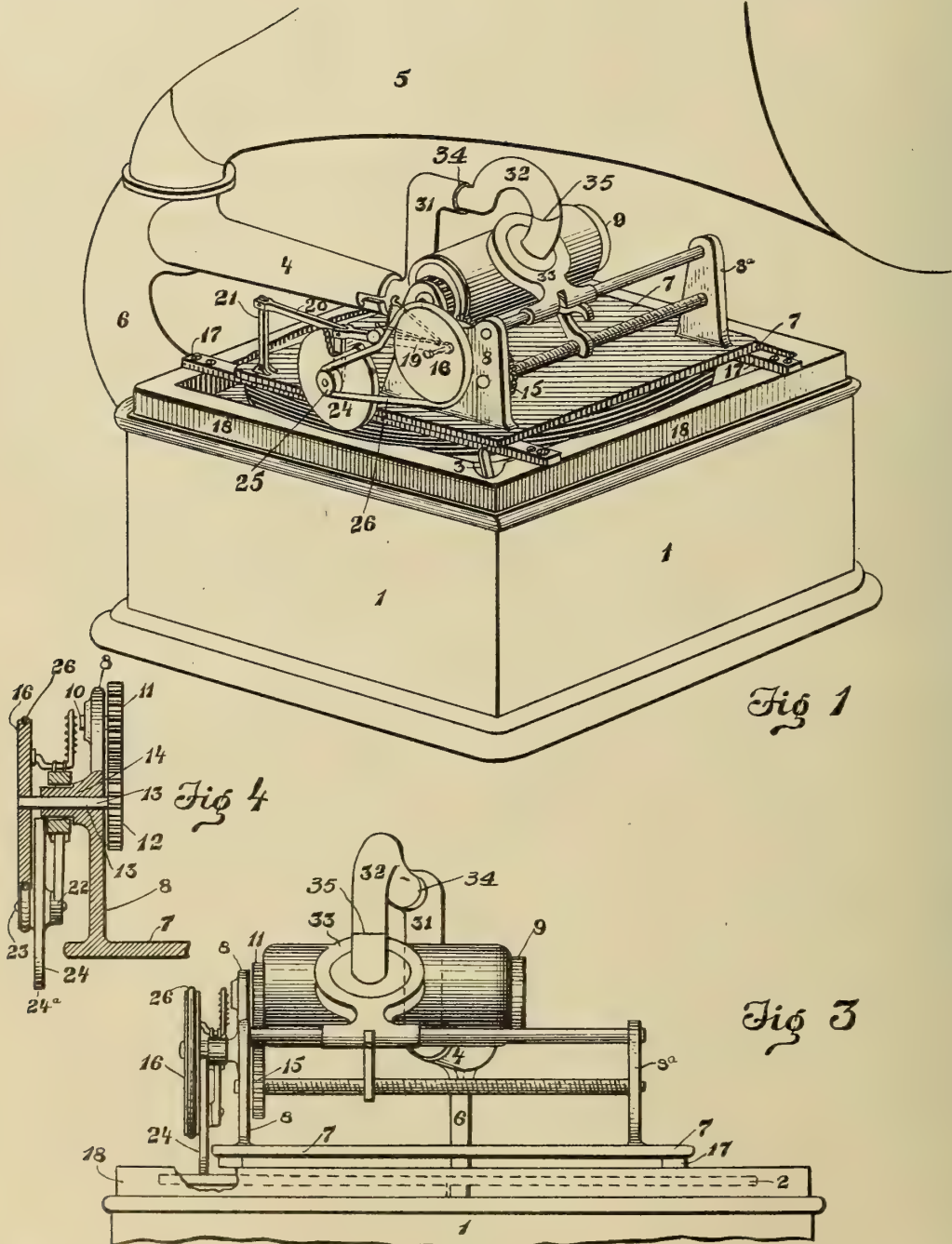
PHONOGRAPH.

APPLICATION FILED MAR. 13, 1911.

Patented Aug. 1, 1911.

2 SHEETS—SHEET 1.

999,646.



Witnesses

R. F. Kohl
Ruth W. Miller

Inventor

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By *Harry Freese,*
Attorney

C. O. HAYS.

PHONOGRAPH.

APPLICATION FILED MAR. 13, 1911.

Patented Aug. 1, 1911.

2 SHEETS—SHEET 2.

999,646.

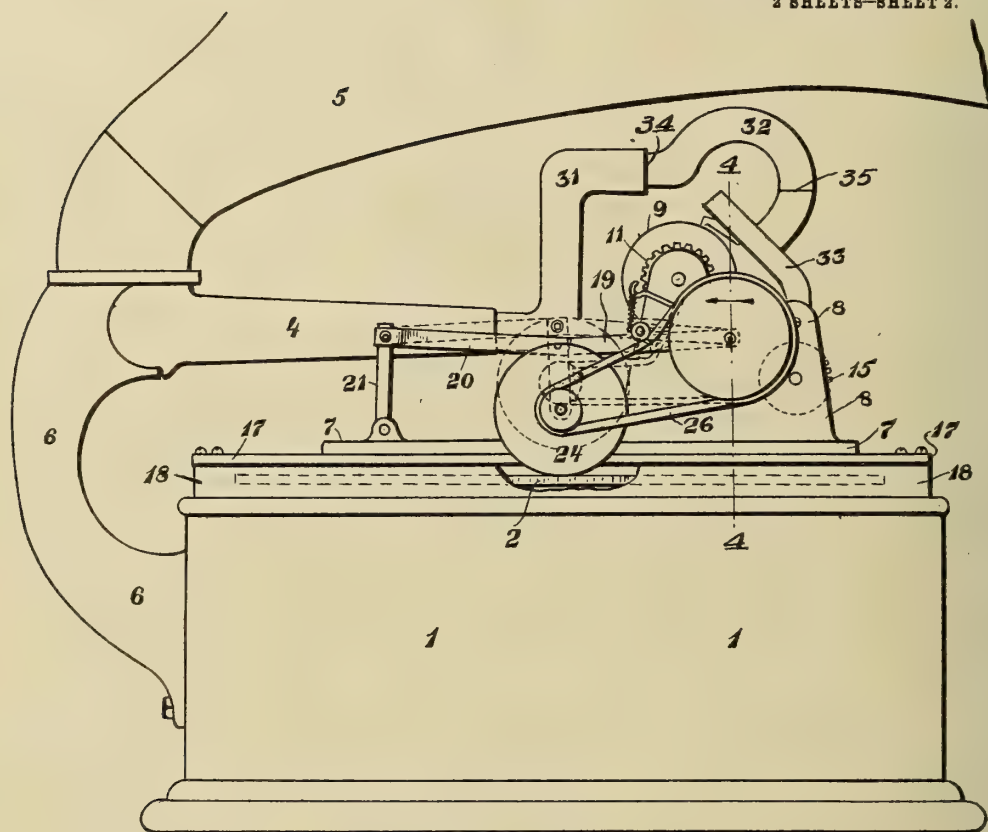


Fig 2

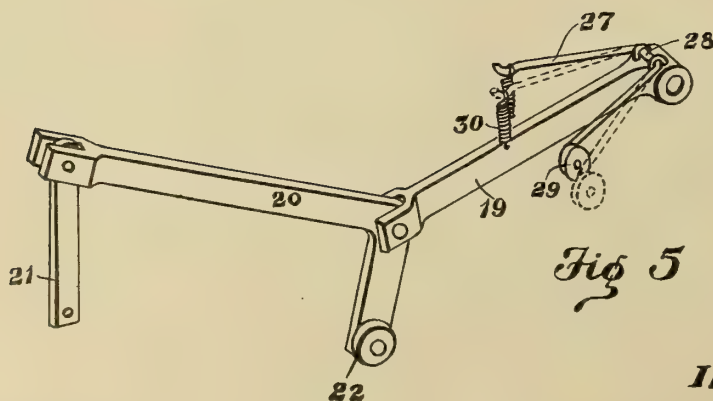


Fig 5

Witnesses
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Ruth C. Miller

Inventor
Charles O. Hays
By *Harry Freese*
Attorney

UNITED STATES PATENT OFFICE.

CHARLES O. HAYS, OF LOCUST CORNER, OHIO.

PHONOGRAPH.

999,646.

Specification of Letters Patent.

Patented Aug. 1, 1911.

Application filed March 13, 1911. Serial No. 614,180.

To all whom it may concern:

Be it known that I, CHARLES O. HAYS, a citizen of the United States, residing at Locust Corner, in the county of Clermont and State of Ohio, have invented certain new and useful Improvements in Phonographs, of which the following is a specification.

The invention relates to the combination of a mandrel mechanism with the operating mechanism of a disk-record phonograph, to the effect that the mandrel mechanism of any ordinary type of phonograph for the use of cylinder records can be used in connection with the cabinet and operating mechanism of any ordinary type of disk-record phonographs. This general object is accomplished by mounting the mandrel mechanism on a suitable frame adapted to rest on the cabinet of the disk machine around the turn table thereof, and by gearing with the mandrel mechanism a friction wheel adapted to travel on the turn table and to be rotated by the same to actuate the mandrel mechanism.

The invention, thus set forth in general terms, is illustrated in the accompanying drawings, forming part hereof, in which—

Figure 1 is a perspective view showing a mandrel mechanism mounted on the cabinet of a disk-record phonograph; Fig. 2, an end elevation of the same; Fig. 3, a front elevation of part of same; Fig. 4, a fragmentary section on line 4—4, Fig. 2; and Fig. 5, a detached perspective view of the compensating levers.

Similar numerals refer to similar parts throughout the drawings.

On the cabinet 1 of the disk-record phonograph is mounted the usual turn table 2, and in the cabinet is provided the usual motor and other operating mechanism (not shown) for rotating the turn table, the same being provided with the usual brake and regulator 3. The tone arm 4 and the horn 5 are mounted on the bracket 6 which in turn is secured to the cabinet in the usual manner. The mandrel mechanism includes the usual base plate 7, the standards 8 and 8^a thereon, the mandrel 9 having its shaft 10 journaled in the standard 8, the gear wheel 11 secured on the mandrel shaft, and the driving gear wheel 12 secured on the driving shaft 13 which is journaled in the bearing 14 formed or secured on the standard 8, which driving gear wheel meshes with the

mandrel-wheel 11 on one side and feed gear wheel 15 on the other side; and on the outer end of the driving shaft is secured the pulley wheel 16.

The base plate 7 of the mandrel mechanism is preferably secured to the cross bars 17 which in turn are secured to the rectangular frame 18 which is adapted to rest on the top of the disk-cabinet freely around the turn table thereof, and in this relation of the parts the cross bars 17 and the base plate of the mandrel mechanism are located freely above the turn table. The oscillating arm 19 is pivoted at one end on the bearing 14 of the driving shaft 13, between the standard 8 and the pulley wheel 16, and is pivoted at the other end to the angle of the L-lever 20, which lever has its horizontal arm pivoted to the upper end of the upright link 21, the lower end of which link is pivoted to the base plate of the mandrel mechanism.

On the lower end of the depending arm of the L-lever 20 is provided the bearing 22 in which is mounted the axle 23 of the friction wheel 24 which is provided with the rubber or frictional tire or periphery 24^a; and on the side of the friction wheel is secured the pulley wheel 25. The belt or band 26 is provided around the pulley wheels. The U-shaped rod 27 is pivoted by its yoke 28 on the oscillating arm 19, on one end of which rod is pivoted the idle wheel 29 and the other end of the rod is connected to the arm 19 by means of the spring 30.

When the mandrel mechanism, with its supporting frame, is placed upon the disk cabinet, the parts are so arranged that the periphery of the friction wheel will rest upon the turn table 2, preferably near the periphery thereof, and be rotated by the frictional contact therewith when the turn table is rotated by its operating mechanism; and it is evident that the oscillating arm 19, the L-lever 20 and the upright link 21, which collectively may be called the compensating levers, will permit the friction wheel to rise and fall to conform to the variations in the height of the turn table as it rotates, and it is evident that by the peculiar arrangement of the compensating levers, that the friction wheel will rise and fall in a substantially vertical line, so that it will neither advance nor retard with reference to the rotation of the disk; it is furthermore

evident that the action of the spring 30 serves to press the idle wheel 29 firmly against the belt 26 at all times, and that as the friction wheel is slightly elevated the idle wheel will press the belt downward to keep it tightly around the pulley wheels. And it will be understood that when the mandrel mechanism is combined with the disk-cabinet, a suitable connecting pipe as 31 is provided to connect the gooseneck 32 of the reproducer frame 33 with the tone arm, there being a rotatable sliding joint at 34 between the connecting pipe and the gooseneck, and a swivel joint at 35 in the gooseneck, so that the phonograph is thus adapted for the use of cylinder records; and that when the mandrel mechanism and corresponding parts are removed, a suitable disk-reproducer (not shown) is secured to the tone arm, thus adapting the phonograph for the use of disk records mounted on the turn table in the usual manner.

I claim:

1. The combination of a phonograph cabinet having a rotatable turn table thereon, a frame adapted to rest on the cabinet around the turn table, a mandrel mechanism on the frame, and a friction wheel resting on the

turn table and having an oscillating gearing connection with the mandrel mechanism. 30

2. The combination of a phonograph cabinet having a rotatable turn table thereon, a frame adapted to rest on the cabinet around the turn table, a mandrel mechanism on the frame, a friction wheel resting on the turn table and having a gearing connection with the mandrel mechanism, and a bearing for the friction wheel connected with the mandrel mechanism, whereby the wheel is adapted to oscillate with the turn table. 35 40

3. The combination of a phonograph cabinet having a rotatable turn table thereon, a frame adapted to rest on the cabinet around the turn table, a mandrel mechanism on the frame, a friction wheel resting on the turn table and having a gearing connection with the mandrel mechanism, and a bearing for the friction wheel having compensating lever connections with the mandrel mechanism, whereby the pulley wheel is adapted to oscillate directly up and down with the turn table. 45 50

CHARLES O. HAYS.

Witnesses:

W. J. TONE,

MERMOS SHALL TROY.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

H. WOLKE.
MECHANICAL MOVEMENT.
APPLICATION FILED JAN. 3, 1907.

999,937.

Patented Aug. 8, 1911.

Fig. 1

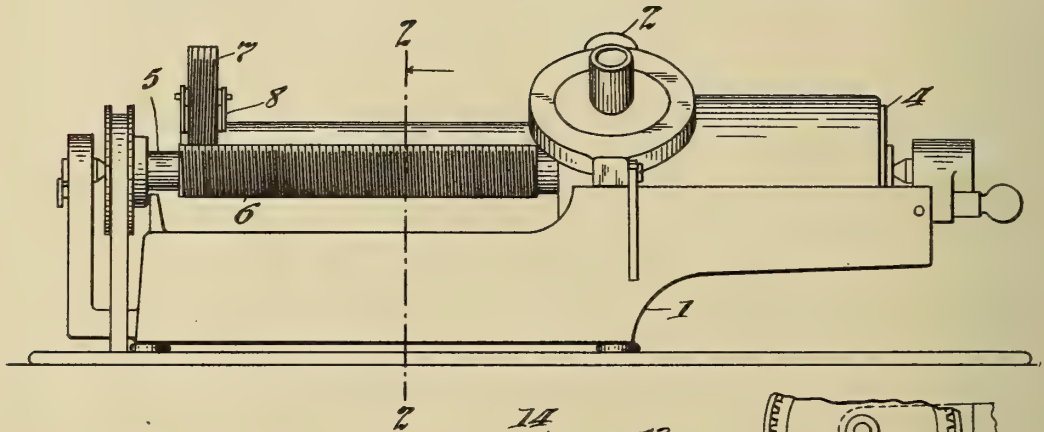


Fig. 3

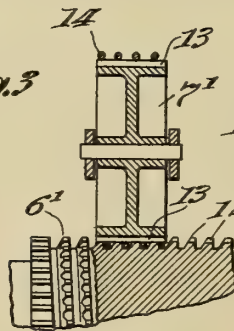


Fig. 4

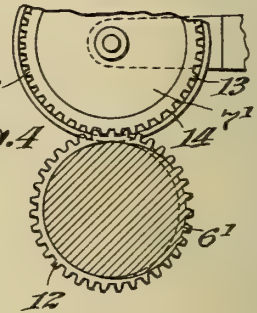


Fig. 2

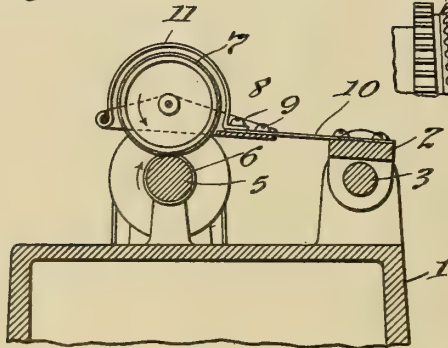
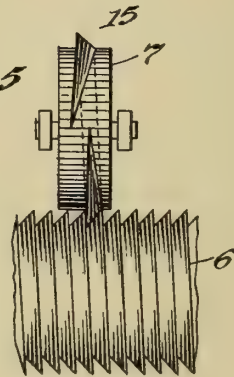


Fig. 5



Witnesses:

Frank D. Lewis

Delos Holden

Inventor:

Herman Mueh

by Frank I. Squire

Atty.

UNITED STATES PATENT OFFICE.

HERMAN WOLKE, OF ORANGE, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO
THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

MECHANICAL MOVEMENT.

999,937.

Specification of Letters Patent.

Patented Aug. 8, 1911.

Application filed January 3, 1907. Serial No. 350,649.

To all whom it may concern:

Be it known that I, HERMAN WOLKE, a citizen of the United States, residing at Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Mechanical Movements, of which the following is a description.

My invention relates to means for imparting a progressive movement to the carriage which carries the reproducer or recorder of a phonograph whereby the same is fed transversely with respect to the direction of movement of the surface of the record and the stylus traces upon the same a spiral path. In devices of this character it has been the usual practice heretofore to provide a feed screw cut with a very fine thread, such as 100 threads to the inch, and to secure to the carriage a spring arm provided with a nut for engagement with said screw, thereby feeding the carriage forward a distance .01" for each revolution of the feed screw. It has sometimes seemed desirable to feed the carriage at a slower rate of speed than this, but for mechanical reasons the production and operation of a screw of finer pitch than that referred to is practically impossible. According to my invention, however, I am able to obtain a very low rate of travel for the carriage, such, for example, as would be produced by a feed screw having 200 threads to the inch and operating in the manner described, without, however, using a screw of any finer pitch than is now used, and in fact, if desired, the pitch of the feed screw may be increased very considerably and at the same time the rate of feed decreased. This result is accomplished by substituting for the feed nut referred to, a rotatable screw or threaded wheel, the thread of which is the reverse of that of the feed screw and of a smaller inclination with respect to a vertical plane, as, for instance, when a wheel of greater diameter than the feed screw is threaded with the same pitch. Such a wheel when supported in frictional engagement with the feed screw will be rotated thereby, and on account of the inclination of the thread of the feed screw being slightly greater than that of the wheel, the screw will exert a thrust thereon and will cause the same to travel at a rate which is equal to the difference between the inclination of

threads, which depends upon the relative diameters of the two parts. For instance, if the wheel be of twice the diameter of the feed screw and both are threaded with a screw of .01 of an inch pitch, each revolution of the feed screw will feed the wheel forward only .005 of an inch. As another example, if the diameter of the feed screw is $5/8''$ and its thread $1/16''$ pitch, and the diameter of the wheel $3/4''$ and pitch $1/16''$, each revolution of the feed screw will feed the wheel forward $1/96''$; or if the threads on these members are $1/32''$ pitch, the feed for each revolution will be $1/192''$. My invention may be properly termed a differential feed, because the forward movement is equal to the difference in the inclination of the threads and may be calculated (when both screws are of same pitch) by subtracting from the pitch of the feed screw the product of the pitch multiplied by a fraction whose numerator is the diameter of the feed screw and whose denominator is the diameter of the other screw.

Referring to the accompanying drawings, Figure 1 is a front elevation of a phonograph provided with a feed device constructed in accordance with my invention; Fig. 2 is a section on line 2-2 of Fig. 1; Fig. 3 is a front elevation, largely in section, of a modified structure; Fig. 4 is a side elevation partly in section, of the device of Fig. 3, and Fig. 5 is a front elevation of a second modification.

Corresponding parts are designated by the same reference numerals in the several views:

The phonograph shown is of the Edison type, and comprises the usual body 1 and carriage 2 which slides upon the back rod 3. The mandrel 4 is mounted upon the main shaft 5 which is provided with a feed screw 6 so threaded as to produce a forward movement of the carriage 2 when the main shaft is rotated in the proper direction. This feed screw, as has been explained, is ordinarily made of a pitch equal to .01". This pitch may be used if desired, or a screw of greater pitch may be used, as before indicated. In engagement with the thread of the screw 6 is a rotatably mounted wheel or screw 7 of greater diameter than the screw 6 and the thread of which is reversed with respect to the thread of the said screw 6. For example, if the screw 6 is a right hand

ed screw, then the thread of the screw 7 is left handed. The wheel 7 is journaled in bearings formed in a yoke 8, which is secured by screws 9 to a spring arm 10 which extends forward from and is secured to the carriage 2. Obviously the wheel 7 will be in yielding frictional engagement with the screw 6, the engaging pressure being due to a portion of the weight of the carriage 2, the spring arm 10 being so set as to produce the proper pressure between the screw 6 and wheel 7. Preferably a semi-circular guard 11 partly encircles the wheel 7 said guard being carried by the yoke 8. It is not absolutely necessary that the pitch of the two screws be the same because, for example, the screw 6 may be provided with a double thread, the pitch of each thread being, say, one fiftieth of an inch, the turns of one thread being of course, exactly midway between the turns of the other thread. In this case the pitch of the wheel 7 could be .01". The thread upon the traveling wheel may consist of a single convolution 15 as shown in Fig. 5.

Instead of relying upon friction to cause rotation of the wheel 7, the same may be positively driven by the feed screw as in the device of Figs. 3 and 4. Here the feed screw 6' which is preferably of coarse pitch, is milled longitudinally to form gear teeth 12 the depth of which is less than the depth of the thread of the screw. The wheel 7' is a spur gear having teeth 13 extending continuously across the width thereof. A wire 14 is secured to the exterior of the gear 7' in such a way as to form a spiral whose pitch is the same as that of the screw 6' and whose direction is reverse. The teeth 13 are adapted to mesh with the teeth 12, while the wire 14 engages the thread of the screw 6' so that the gear 7' is driven by the said screw.

While I have described my invention as applied to a phonograph for producing the desired feed of the traveling carriage, it is obviously not limited to such use, and may be applied to any mechanism whatever for converting rotary movement into progressive lineal movement.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is as follows:

1. A mechanical movement comprising a longitudinally immovable feed screw, a movable carriage, and means for progressing said carriage along said feed screw, comprising a screw mounted free to rotate and carried by the carriage with its thread constantly in mesh with that of said feed screw during the progression of the carriage, said screws being of reverse thread and the diameter of the feed screw being less than that of the traveling screw, substantially as set forth.

2. A mechanical movement comprising a

longitudinally immovable feed screw, a movable carriage, and means for progressing said carriage along said feed screw, comprising a single screw mounted free to rotate and carried by the carriage with its thread constantly in mesh with that of said feed screw during the progression of the carriage, said screws being of reverse thread and of the same pitch, the diameter of the feed screw being less than that of the traveling screw, substantially as set forth.

3. A mechanical movement comprising a longitudinally immovable feed screw, a movable carriage, and means for progressing said carriage along said feed screw, comprising a single screw mounted free to rotate and carried by the carriage with its thread constantly in mesh with that of said feed screw during the progression of the carriage, said screws being of reverse thread, and the thread of the traveling screw being of smaller inclination than that of the feed screw, substantially as set forth.

4. A mechanical movement comprising a feed screw, a movable carriage, and means for progressing said carriage along said feed screw, comprising a screw mounted free to rotate and carried by the said carriage in constant yielding engagement with said feed screw during the progression of the carriage, said screws being of reverse thread, substantially as set forth.

5. A mechanical movement, comprising a feed screw, a movable carriage, a spring arm secured to said carriage, and means for progressing said carriage along said feed screw comprising a screw mounted free to rotate and secured to said arm and engaging said feed screw during the progression of the carriage, said screws being of reverse thread, substantially as set forth.

6. A mechanical movement, comprising a feed screw formed with radial teeth, and also with a screw thread, a movable carriage, and means for progressing said carriage along said feed screw with a differential movement, comprising a rotatable screw formed around its entire periphery with radial teeth and also with a screw thread, and carried by said carriage, the thread and teeth of said rotatable screw being in constant engagement with the thread and teeth of said feed screw during the progression of the carriage, and said screws being of reverse thread, substantially as set forth.

7. A mechanical movement comprising a feed screw formed with a helical thread and also with radial gear teeth of a depth less than that of the thread, a carriage movable axially of said screw, and a wheel carried by said carriage, said wheel formed with gear teeth and with a spiral convolution surrounding said teeth, of the same pitch as the thread of the screw, the thread and teeth of said screw being in engagement with the

convolution and teeth of said wheel, substantially as set forth.

8. In a phonograph, the combination with the sound box, a support for the same, and
5 the mandrel, of means for causing a relative shift of said sound box support and mandrel axial of said mandrel, comprising a feed screw rotatable with said mandrel and a
10 threaded wheel mounted free to rotate and carried by the sound box support, with its thread constantly in mesh with that of said feed screw, during relative movement in one direction between said support and said

screw, the diameter of said wheel being different from that of said screw, said mandrel 15 and support being relatively shiftable members and one of said members being immovable longitudinally of said mandrel, substantially as set forth.

This specification signed and witnessed 20 this 21st day of December 1906.

HERMAN WOLKE.

Witnesses:

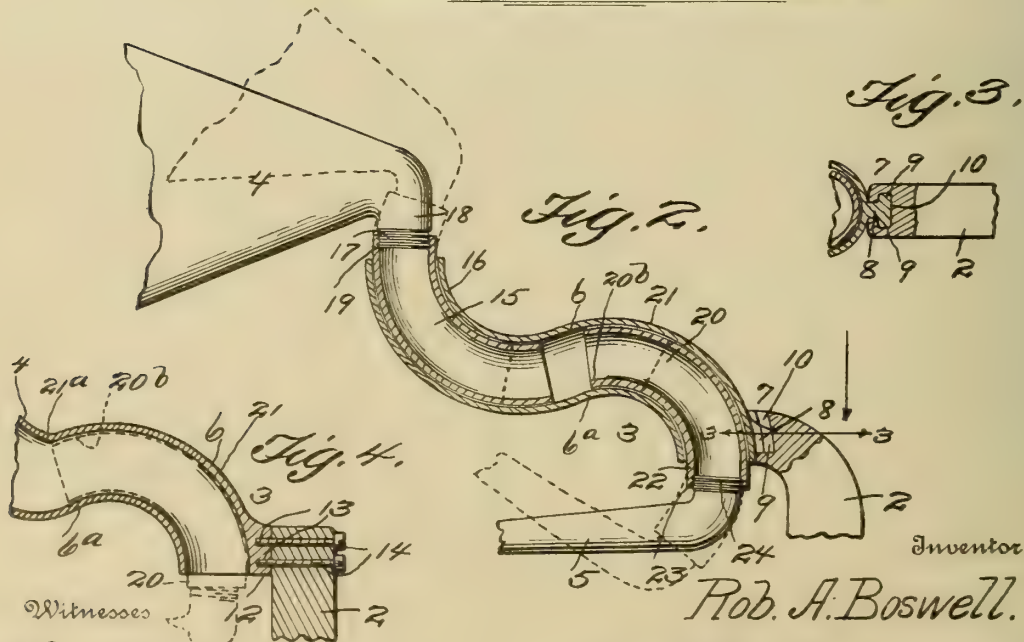
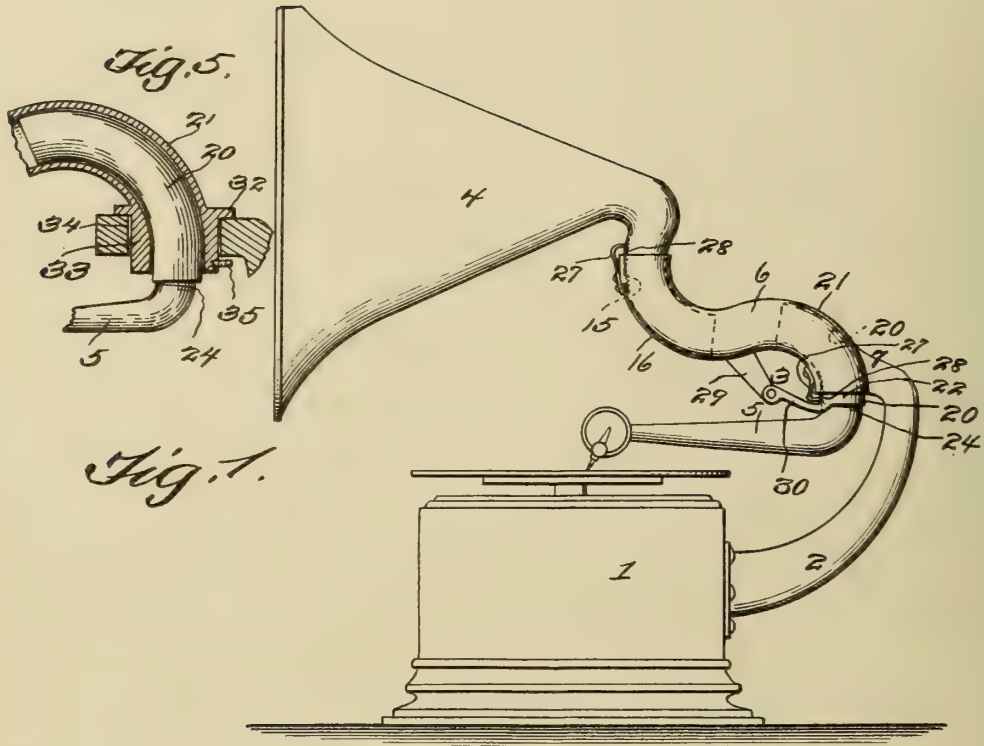
FRANK L. DYER,
ANNA R. KLEHM.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

R. A. BOSWELL.
 AMPLIFYING HORN FOR TALKING MACHINES.
 APPLICATION FILED MAY 11, 1910.

999,954.

Patented Aug. 8, 1911.



Witnesses
 Edward S. Ford,
 Walker Moore

Inventor
 Rob. A. Boswell.
 By R. A. Boswell & Co.
 his Attorneys

UNITED STATES PATENT OFFICE.

ROBERT A. BOSWELL, OF WASHINGTON, DISTRICT OF COLUMBIA.

AMPLIFYING-HORN FOR TALKING-MACHINES.

999,954.

Specification of Letters Patent.

Patented Aug. 8, 1911.

Application filed May 11, 1910. Serial No. 560,562.

To all whom it may concern:

Be it known that ROBERT A. BOSWELL, a citizen of the United States of America, residing at Washington, District of Columbia, has invented a new and useful Amplifying-Horn for Talking-Machines, of which the following is a specification.

The invention about to be set forth and claimed belongs to the art of acoustics, and it particularly pertains to a new and useful sound conveying tube having a compound curved tubular member arranged at a point between the free ends thereof, and adapted for use upon talking machines and the like.

The novel principle of this invention is to support the arm and horn in the compound curved tubular member, in order to have free movements, whereby the stylus of the sound box may accommodate itself to the sound waves, or annular indentures of the record.

A further feature of the invention is to so connect and support the arm and the horn of this particular form as to allow the arm to be readily lifted from the record, in order to dispose it slightly to one side thereof, or to raise the horn vertically. When the horn is raised, the same is easily and readily supported within a portion of the compound curved tubular member by friction. It is also understood that the arm may be supported in the member by friction. The horn, as shown in Figure 2, may be so arranged as to swing laterally, as well as vertically, but, as shown in Figure 1, the lateral movement of the horn is dispensed with.

In the exposition of this specification, a particular design of machine is adhered to but the invention is not to be confined to this special design. Its reduction to practice may require certain changes and alterations which the right is claimed to make, provided such changes and alterations are comprehended by the appended claims.

The sound conveying tube proper only consists of three parts, and so supported, as above stated, as to perform all the necessary functions required upon a talking machine.

Further features and the arrangement of parts will be hereinafter set forth and pointed out in the claims.

Referring to the drawings,

Figure 1 is a side elevation of a talking machine, showing an amplifying horn applied thereto, and provided with the com-

pound curved tubular member, for the support of the free moving parts of the horn.

Figure 2 is a vertical sectional view through the compound curved tubular member, which is shown in Figure 1, with the exception that the members 29 and 30 are eliminated.

Figure 3 is a sectional view on line 3—3 of Figure 2, disclosing the connection between the compound curved member and its support.

Figure 4 is a detail sectional view, showing a portion of the compound curved tubular member, connected to its support by means of screws.

Figure 5 is a detail sectional view of a modified form of the mounting of either the compound curved member 6 or the curved member 21.

As to the drawings, 1 denotes the casing of a talking machine, containing the usual mechanism (not shown) for rotating the table carrying the records.

2 represents a bracket secured to one side of the casing for supporting the amplifying horn 3.

The amplifying horn comprises the horn proper 4 and the reproducer arm 5, which are movably supported within the compound curved tubular member 6. The tubular member is detachably supported upon the bracket 2, as shown at 7. The compound curved tubular member is provided with a projection 8, which has lateral projections 9, which, together with the projection 8, form an approximately T-shaped member, which is dove-tailed or received within the recess 10 of the bracket 2. This recess conforms to the shape of the T-shaped projection, and is designed to fit neatly and snugly therein, there not being sufficient friction to prevent the ready removal of the said T-shaped projection.

In Figure 1, the compound curved tubular member, at its lower portion, is slightly enlarged, as shown at 12, which is provided with threaded recesses 13. The bracket 2, in Figure 4, is penetrated by a pair of screws 14, which are threaded into the recesses 13, in order that the tubular member may be readily and detachably supported upon the bracket 2.

In Figure 1, the horn proper, at its restricted portion, terminates into a curved neck 15, which is telescopically received

E. T. CONDON, JR.
ATTACHMENT FOR TALKING MACHINES.
APPLICATION FILED FEB. 2, 1909.

1,000,582.

Patented Aug. 15, 1911.

Fig. 1

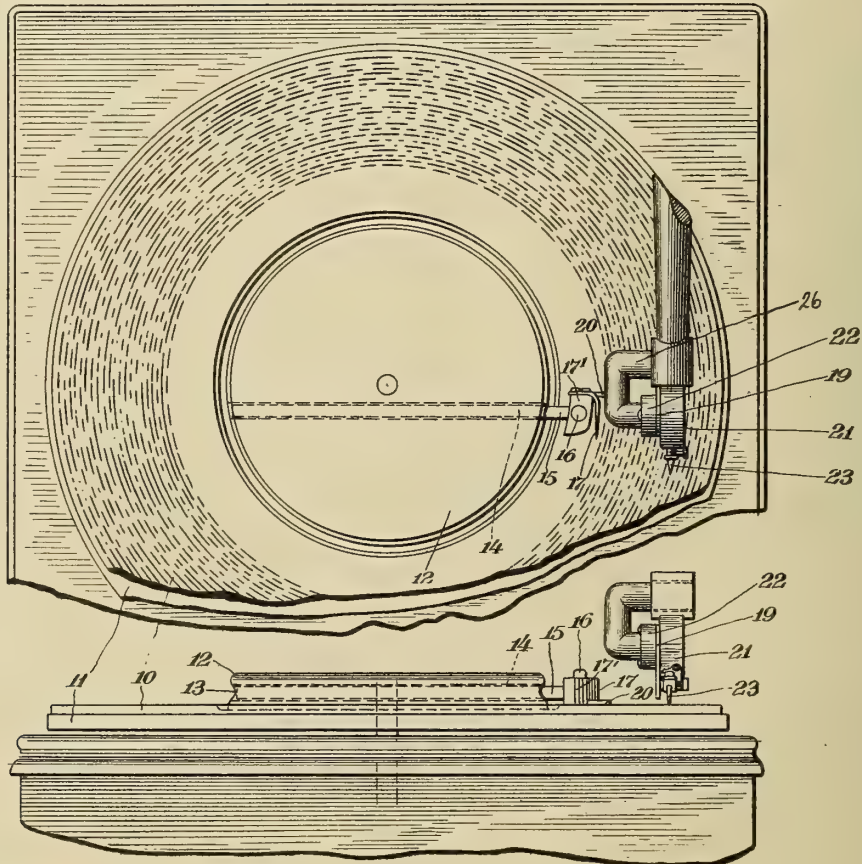
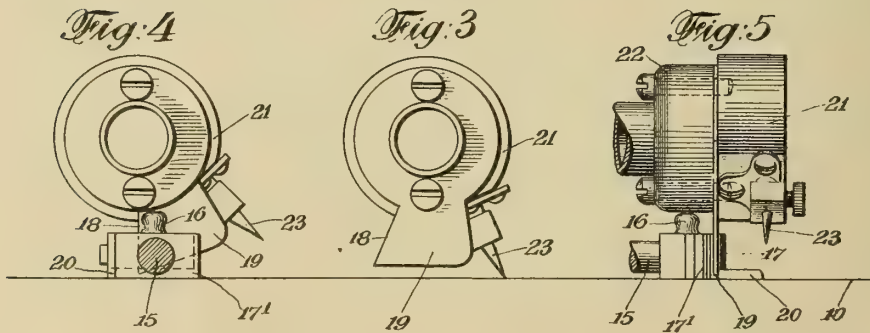


Fig. 2



Witnesses:
W. A. Leckell
J. E. F. Hatcher.

Edward Thomas Condon, Jr. Inventor
By his Attorney *W. A. Leckell*

UNITED STATES PATENT OFFICE.

EDWARD THOMAS CONDON, JR., OF MORRISTOWN, NEW JERSEY.

ATTACHMENT FOR TALKING-MACHINES.

1,000,582.

Specification of Letters Patent. Patented Aug. 15, 1911.

Application filed February 2, 1909. Serial No. 475,686.

To all whom it may concern:

Be it known that I, EDWARD T. CONDON, Jr., a citizen of the United States, and a resident of Morristown, in the county of Morris and State of New Jersey, have invented certain new and useful Improvements in Attachments for Talking-Machines, of which the following is a specification.

My invention relates to attachments for talking machines, and particularly to talking machines employing a rotating record disk.

It has for its object to automatically stop the rotation of the disk as well as to disengage the needle from said disk when the end of the record has been reached; also, to provide extremely simple means to accomplish this result and which may readily be attached to apparatus already in use, no change in the same being required.

I am aware that various attachments have been devised to automatically stop the rotation of the disk, but so far as I am aware, all these devices throw the action upon the needle itself, or do not disengage the needle from the record or other surface. The diaphragm, which is a very delicate and a most important part of the apparatus, is thus exposed to serious damage, and all movements of the needle will be reproduced to the annoyance of the listeners. With my attachment, however, the needle is at once disengaged from the record disk as soon as the end of the piece is reached, and the motion of the said record disk arrested. The attachment, also, is suited for any existing machine of the disk record type without requiring the slightest change in same, and is readily removed if not required.

The nature of my invention will be best understood in connection with the accompanying drawings in which—

Figure 1 is a plan view showing my device attached. Fig. 2 is a side elevation. Fig. 3 is a detail view showing the attachment of the locking plate. Figs. 4 and 5 are side and front elevations respectively, illustrating the locking plate in locked position and the needle disengaged.

Similar characters of reference designate corresponding parts through the several views.

Referring now to the drawings, 10 indicates a rotatable record disk mounted to rotate with a support 11. Over this disk 10 and resting upon a part of the unmarked

portion of said disk is placed a plate 12 preferably provided with a circumferential groove 13 so that the same may be readily lifted off the disk 10 when removing the record. This plate is of sufficient surface to allow it to be carried along with the disk 10 in its rotation. If there be not sufficient friction to accomplish this, the underside may be covered with felt or the like. A hole 14 is bored horizontally through this plate 12 as near the center as possible, and through the same passes an arm 15 slidably held therein, so as to be adjustable for various sizes of record disks, and is thus firmly supported by the said plate. A handle 16 is provided to adjust the arm 15. At one end, the said arm is provided with a recessed stop consisting of a flexible guide 17 and block 17' forming with each other a suitable angle or broadly a recess so as to engage with a co-acting member on the reproducer, in this case the edge 18 of a locking plate 19. This edge is suitably beveled so that as contact is made between the stop and the plate 19, the latter is slightly raised, contact being first made at the bottom of the plate. An indicator gage 20 is carried by the head of the arm 15 to enable the recessed stop to be properly set with respect to the record. The relation between the parts is such that when the arm 15 is adjusted to bring the gage to the particular line of the record at which it is desired that the playing should stop, then the recessed stop on said arm will also be in correct position to receive the member 19 on the reproducer, as soon as the rotation of the record has brought the needle to the line thereon at which the gage has been located as aforesaid.

The plate 19 is secured to the reproducer 21, being held against its rubber insulator 22; and its lower edge is arranged to be a slight distance above the point of the needle 23 so as not to make contact with the record disk 10 or indicator 20. As the edge 18 of plate 19 slides into the stop, the plate 19 is slightly raised as explained, raising the reproducer (which it will be understood pivots about the section of tubing 26 as an axis) and lifting thereby the needle 23 free of the record disk 10 and also stopping the rotation of said disk. By making the arm 15 adjustable as explained, the stop may be set to cooperate with the plate 19 so that the needle 23 is disengaged from the disk 10

at practically the conclusion of the piece and the movement of the disk arrested.

I claim:—

1. In a disk-record talking machine: a
5 plate adapted to fit over and be carried by
the record disk, and having a horizontal hole
bored through the same; an arm passing
slidably through said hole and supported
10 by said plate; a stop at one end of said arm;
and a locking member carried by the re-
producer of said talking machine, adapted
to lock in said stop when the needle has
reached the end of the record and to dis-
engage the needle from the said record disk.

2. In a disk-record talking machine: a
15 plate adapted to fit over and be carried by
the record disk, and having a horizontal hole
bored through the same; an arm passing
slidably through said hole and supported by
20 said plate; a stop at one end of said arm;
and a plate secured to the reproducer of said
talking machine and having its lower edge
a slight distance above the point of the
needle, and being adapted to lock in said
25 stop when the needle has reached the end of
the record and to disengage the needle from
the said record disk.

3. In a disk-record talking machine: a
30 plate of large bearing surface adapted to
fit over and be carried by the record disk,
and having a horizontal hole bored through
the same; an arm passing slidably through
said hole and supported by said plate; a
stop at one end of said arm; and a thin plate
35 secured to the reproducer of said talking
machine, having its lower edge a slight dis-
tance above the point of the needle, and be-
ing adapted to lock in said stop when the
needle has reached the end of the record,

the angle of contact between an edge of said
40 plate and the stop being such as to lift the
reproducer slightly and thereby disengage
the needle from the said record disk.

4. In combination with a disk-record talk-
ing machine having a pivotally supported
45 reproducer,—a member carried by the center
portion of the record-disk having a radially
extensible arm provided at its outer end with
a stop consisting of a pair of vertically dis-
posed members separated by a slight cleft,
50 at least one of said members being flexible;
and a vertically disposed plate carried by the
reproducer, to enter edgewise and lock in
the cleft of the stop to tilt the reproducer
and its needle off the record and stop the ro-
55 tation of the record.

5. In combination with a disk-record talk-
ing machine having a pivotally supported
reproducer,—a member carried by the center
60 portion of the record-disk having a radially
extensible arm provided at its outer end
with a stop consisting of a pair of vertically
disposed members separated by a slight cleft,
at least one of said members being flexible;
65 a vertically disposed plate carried by the re-
producer, to enter edgewise and lock in the
cleft of the stop to tilt the reproducer and
its needle off the record and stop the rota-
tion of the record; and an indicator gage on
70 said outer end of the extensible arm.

Signed at New York in the county of New
York and State of New York this 1st day of
February A. D. 1909.

EDWARD THOMAS CONDON, JR.

Witnesses:

FREDK. F. SCHUETZ,

SALLY O. YUDIZKY.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,
Washington, D. C."

J. C. ENGLISH.

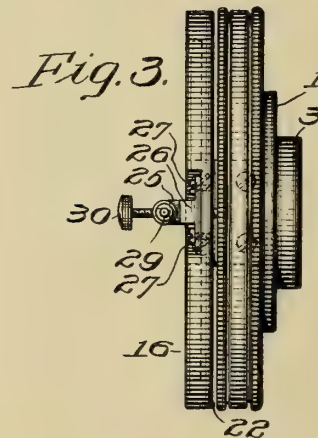
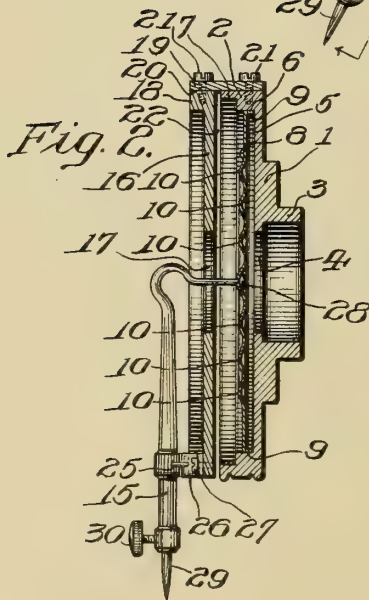
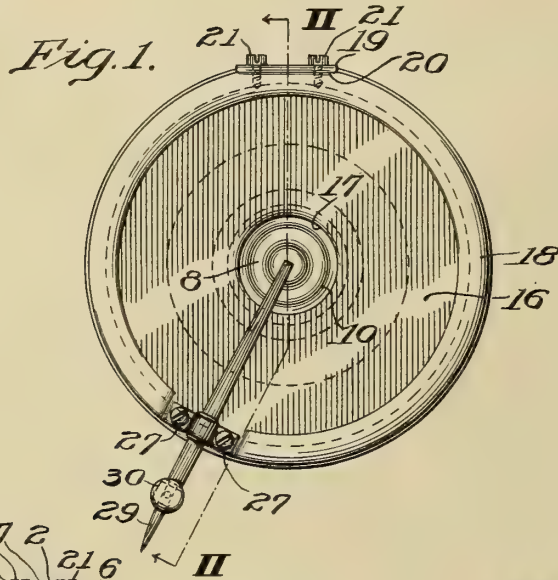
SOUND BOX.

APPLICATION FILED FEB. 8, 1910.

1,001,746.

Patented Aug. 29, 1911.

2 SHEETS—SHEET 1.



WITNESSES
H. J. Hartman.
A. J. Gardner.

BY

INVENTOR
John C. English.

Home

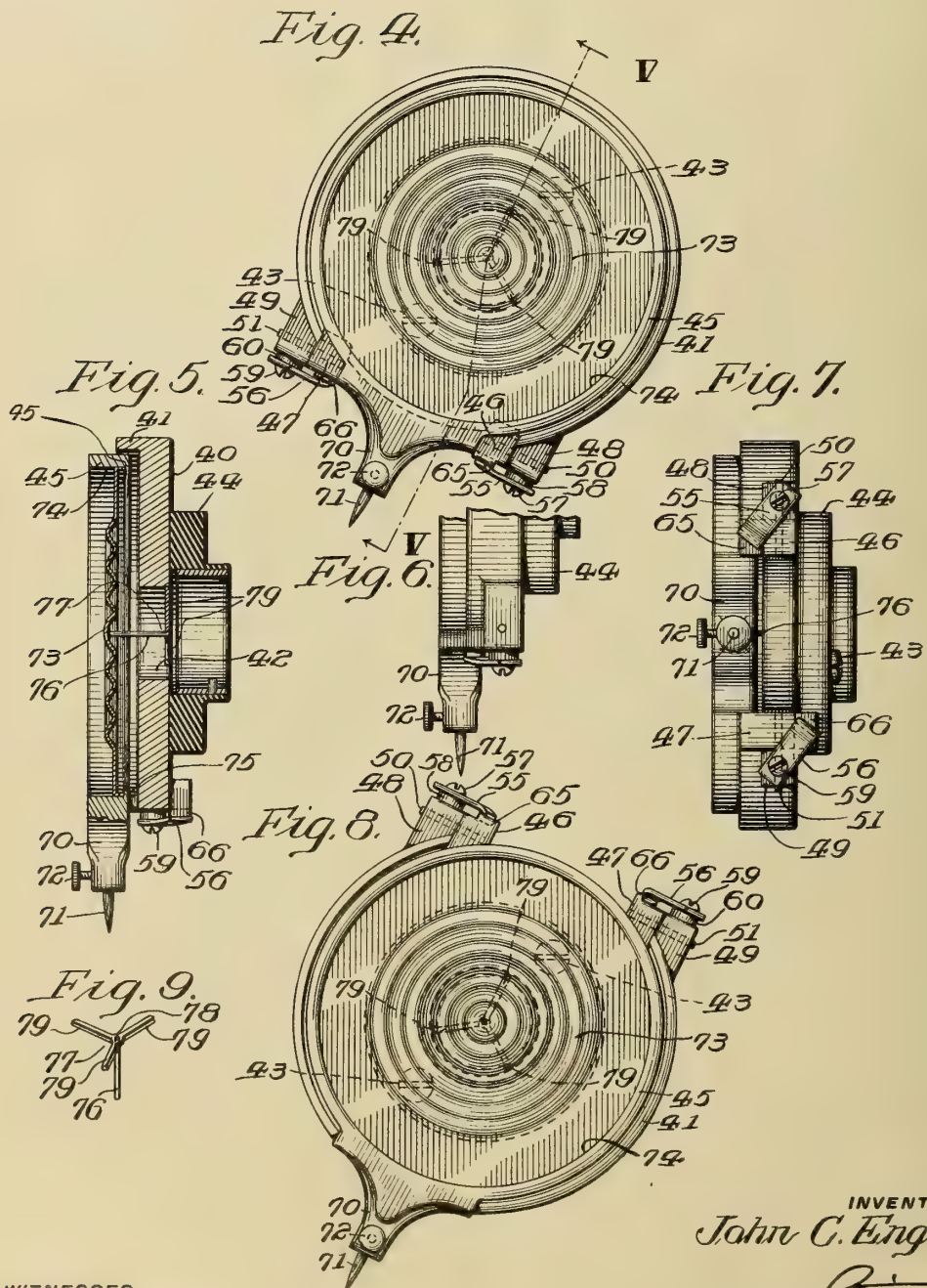
ATTORNEY

J. C. ENGLISH.
SOUND BOX.
APPLICATION FILED FEB. 8, 1910.

1,001,746.

Patented Aug. 29, 1911.

2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

JOHN C. ENGLISH, OF CAMDEN, NEW JERSEY, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

SOUND-BOX.

1,001,746.

Specification of Letters Patent. Patented Aug. 29, 1911.

Application filed February 8, 1910. Serial No. 542,745.

To all whom it may concern:

Be it known that I, JOHN C. ENGLISH, a citizen of the United States, and a resident of the city of Camden, county of Camden, State of New Jersey, have invented certain new and useful Improvements in Sound-Boxes, of which the following is a full, clear, and exact disclosure, reference being had to the accompanying drawings, forming a part of the following specification.

This invention relates to certain new and useful improvements in sound boxes for talking machines, as will be fully described hereinafter and particularly pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a front elevation of a sound box constructed in accordance with this invention; Fig. 2 a section of the same on line II—II of Fig. 1 looking in the directions of the arrows; Fig. 3 a bottom plan view of the same. Fig. 4 is a front elevation of a modified form of sound box constructed in accordance with this invention; Fig. 5 a section on line V—V of Fig. 4, looking in the directions of the arrows; Fig. 6 a fragmentary side elevation of a portion of this modified form; Fig. 7 a bottom plan view of the same; Fig. 8 a front elevation of a modified form of this invention; and Fig. 9 a perspective of a detail of the same.

Referring to the drawings, one embodiment of this invention comprises a casing, which consists of an annular plate 1, of metal or any suitable material, having a forwardly projecting peripheral rim 2, and a rearwardly projecting tubular flange 3 surrounding the central aperture 4 of the plate, the flange 3 being adapted for connecting the sound box to any suitable tubular sound conveyer. The front or inner surface 5 of the plate or casing 1 is preferably flat, but may be of any desired form, and the inner surface of the rim 2, is preferably in the form of a stepped cylinder in two diameters, the inner cylindrical surface 6 of the rim being less in diameter than the outer cylindrical surface 7 thereof, and being adapted to support a diaphragm 8. The inner surface of the rim may, however, be of any suitable shape to form, with the inner surface of the body of the casing, a diaphragm chamber. The diaphragm 8 may be made of any suitable material, and in any suitable form, for instance, the dia-

phragm may be constructed of metal having an inwardly turned peripheral cylindrical flange 9 adapted to fit snugly in the cylindrical wall 6 of the casing and to be frictionally retained fixed therein, the rear edge of the rim being in abutment with the inner flat surface of the casing. The diaphragm may also be provided with a series of concentric corrugations 10.

To form a suitable support or mounting for a stylus bar 15, a vibratory member 16 is provided, which is made of metal or any suitable material and preferably annular in shape, and of substantially the same external diameter as the diameter of the casing 1. The main portion of this vibratory member is preferably flat, and is provided with a central aperture 17 of substantially the same diameter as the diameter of the central aperture 4 in the casing, and with a forwardly projecting marginal rim 18. The vibratory member 16 is comparatively rigid, and is secured to the casing 1 by means of a yielding member 19 made of tempered spring steel, or of any other suitable resilient material. The yielding member 19 is preferably in the form of a flat plate, and the rim 18 of the vibratory member 16 and the rim of the casing 1 are flattened externally, as at 20, to form a suitable seat for the yielding member, which is secured in place by means of screws 21 extending through the yielding member and threaded into the rim of the vibratory member and the rim of the casing respectively. The space 22 between the vibratory member 16 and the casing 1, is preferably very small and only sufficient to permit of the necessary vibrations of the vibratory member. The vibratory member is thus connected to the casing 1 by the yielding member 19, and is free to vibrate with respect to the casing upon an axis extending through the yielding member substantially parallel to the diaphragm 8 and in alignment with the space 22 between the vibratory member and the yielding member.

The stylus bar 15 may be of any suitable form, and is connected to or mounted upon the vibratory member 16 by any suitable connection or mounting, which may or may not be resilient and which is preferably arranged upon the front of the vibratory member 16, and diametrically opposite the yielding member 19 which connects the vi-

bratory member to the casing. One form of mounting which may be used to connect the stylus bar 15 to the vibratory member 16, consists of a flat yielding plate or member 25, made of tempered spring steel or any suitable material, which is secured at one end to the stylus bar in a slot provided therefor in the bar, and at its other end is secured in a slot in a rigid base plate 26, which is rigidly connected to the vibratory member 16 by means of screws 27, the space between the stylus bar and the base plate 26 is preferably only sufficient to permit of the necessary oscillation of the bar, and the bar is thus mounted upon the yielding connection 25 to oscillate in a plane perpendicular to the diaphragm about an axis substantially fixed with respect to the vibratory member 16 and parallel to the axis of oscillation of the vibratory member. The resilient connection 25 between the stylus bar and the vibratory member 16 is preferably made thinner and lighter, and consequently much more sensitive than the resilient connection 19 between the vibratory member 16 and the casing 1 of the sound box.

The stylus bar 15 is preferably made of any suitable resilient metal or material, and the inner portion of the stylus bar is tapered and turned outwardly and then inwardly and downwardly in the form of a compound curve, and the inner end 28 of the bar is suitably connected to the central portion of the diaphragm. The main portion of the stylus bar extends radially with respect to the sound box and the outer end of the bar is provided with the usual stylus socket for receiving a stylus 29 which is held in position as usual by a thumb screw 30.

In the operation of this sound box, the ordinary sound oscillations of the stylus bar are transmitted to the diaphragm through the yielding of the resilient connection 25 between the bar and the vibratory member 16, but any unusual shocks or jars are taken up by the yielding of the connection 19 between the vibratory member 16 and the sound box casing, and by the yielding of the curved inner portion of the stylus bar, and the effects of such shocks or jars on the diaphragm are thus minimized or softened, and practically eliminated, which prevents the defective qualities technically known as "blast" or "rattle" or "shatter" and other unpleasant qualities which are incident to the operation of some sound boxes under some conditions.

One of many modifications of this invention comprises as illustrated in Figs. 4 to 8 of the drawings, a sound box consisting of an annular casing 40 having a forwardly projecting peripheral rim 41 and a central aperture 42 which serves as usual, to conduct sound waves. Upon the rear face of the casing 40 is secured, by means of screws 43,

a tubular extension 44, whereby the sound box may be connected to the usual sound conveying tube. Telescoping snugly but movably within the rim 41 of the casing is an annular vibratory member 45, which is connected to the casing in any suitable manner to oscillate with respect thereto. The connection between the vibratory member 45 and the casing 40 may consist, as shown in the drawings, of two rearwardly projecting peripheral lugs 46 and 47 rigid with the vibratory member 45 and projecting in the recess provided therefor in the rim 41 of the casing and rotatably engaged against the inner surfaces of two lugs 48 and 49 respectively, which project outwardly from the rim 41 of the casing and are rigid therewith. Pivots 50 and 51 arranged in alinement, extend between the projections 46 and 48, and 47 and 49 of the vibratory member and the casing respectively, whereby the vibratory member is pivoted to the casing upon a fixed axis. For holding the vibratory member 45 yieldingly in a predetermined position upon its pivots with respect to the casing 40, a pair of springs, 55 and 56, are provided, one of which is secured at one end by a screw 57 to the lug 48 on the casing, a washer 58 being interposed between the spring and the lug. The other spring, 56, is secured at one end to the lug 49 of the casing by means of a screw 59, a washer 60 being interposed between the spring and the lug. One of these springs, 55, extends forwardly from the casing and engages a boss 65 arranged in front of the axis of oscillation of the vibratory member 45 upon the lug 46 rigid with the vibratory member and the other spring 56, extends rearwardly from the casing and engages a boss 66 in the rear of the axis of oscillation of the vibratory member on the lug 47 rigid with the vibratory member. The springs, 55 and 56, are normally held by their screws 57 and 59, under a tension, and the outer ends of these springs, therefore, normally press upon the boss of the vibratory member and hold the vibratory member yieldingly under a balanced tension in a predetermined position. A stylus bar 70 projects radially from the vibratory member 45 rigid therewith, and is provided with the usual socket for holding a stylus 71, which is secured in place by the usual thumb screw 72. The stylus bar may be arranged between and adjacent the pivots 50 and 51, which form or determine the axis of oscillation of the bar, as shown in Figs. 4 to 7, or the bar might be arranged diametrically opposite to this position, as shown in Fig. 8, or in any other suitable position with respect to the casing. A diaphragm 73, of any suitable construction, is mounted within the vibratory member 45. This diaphragm 73 may be of similar form and construction to that previously

described, the vibratory member 45 being provided with a suitable cylindrical bore 74 adapted to receive the diaphragm and to hold the flanged edge of the diaphragm in a fixed position, and with an inwardly projecting rim 75 upon its inner edge to position the diaphragm. The central portion of the diaphragm 73 is yieldingly connected to the casing 40 by any suitable means, in this instance, by a stiff rod 76 of steel or any other suitable rigid material, and a spider or bridge 77 of steel or brass or any other resilient material, which preferably consists of a central portion 78 and a plurality of arms 79 radiating therefrom and spaced apart at equal angles. The rod 76 extends axially of the sound box from the diaphragm 73 rearwardly and at its outer end engages and is secured in any suitable manner to the inner surface of the diaphragm at the center of the diaphragm. The inner end of the rod 76 is rigidly secured to the central portion 78 of the spider 77. The spider 77 is preferably normally flat and so arranged in a plane perpendicular to the rod 76, and substantially in alinement with the rear surface of the casing 40. The outer end of the arms 79 are rigidly connected to the cylindrical wall of the opening 42 of the casing, by solder or by any other suitable means. The dimensions of the spider are such that it will flex or yield slightly under the maximum vibrations of the diaphragm but will be practically stationary under slight vibrations of the diaphragm, and will not yield under any condition as readily as the annular vibratory member 45 supporting the diaphragm. With this modified construction in mind, it is evident that in operation, its action will be similar to the action of the form previously described, and ordinarily the central portion of the diaphragm will be held substantially stationary with respect to the casing 40 by the rod 76 and spider 77, and ordinarily as the stylus bar 70 oscillates under the action of a sound record, the vibratory annular member 45 to which the rim of the diaphragm is fixed will be caused to vibrate about its pivots 50 and 51, under the restraining influence of the springs 55 and 56, and the diaphragm will thus be flexed between its rim and its central portion, and the sound waves will be transmitted through the outlet 42 of the sound box. When, however, the stylus is subjected to any unusual shocks or jars, the spider 77 will yield sufficiently to minimize the effect of such shocks or jars as in the form hereinbefore described.

It is obvious that the spider might consist of but two radial arms arranged in alinement to form a bridge extending diametrically of the opening 42 or the spider might be of any other suitable construction to form a yielding support for the rod 76.

Although only two forms in which this invention may be embodied have been illustrated, it is obvious that the invention might also be embodied in various other forms without departing from the spirit of this invention, or the scope of the appended claims.

Having thus fully described this invention, I claim and desire to protect by Letters Patent of the United States:

1. In a sound box, the combination with a casing, of a diaphragm carried thereby, a vibratory member resiliently mounted on said casing, and a stylus bar mounted to oscillate upon said vibratory member, said bar being connected to said diaphragm by means of an outwardly curved tapering resilient portion of said bar.

2. In a sound box, the combination with a casing, of a diaphragm carried thereby, a fixedly secured resilient member, a vibratory member mounted by means of said member to oscillate on said casing, a stylus bar and a fixedly secured resilient member connecting said bar and said vibratory member, said stylus bar being connected through a tapering outwardly curved resilient portion to said diaphragm at a point between the axis of oscillation of said stylus bar with respect to said vibratory member, and the axis of oscillation of said vibratory member.

3. In a sound box, the combination with a casing, of a vibratory member mounted by means of a fixedly secured resilient member to oscillate thereon, a diaphragm carried by said casing, and a stylus bar mounted on said vibratory member by means of a second fixedly secured resilient member to oscillate with respect thereto, said stylus bar being connected to the central portion of said diaphragm, and the axis of oscillation of said vibratory member with respect to said casing and the axis of oscillation of said stylus bar with respect to said vibratory member being upon diametrically opposite sides of the axis of said diaphragm.

4. In a sound box, the combination with a casing, of a vibratory member, a fixedly secured resilient connection between said casing and said vibratory member, a stylus bar and a second fixedly secured resilient connection between said stylus bar and said vibratory member forming a support for said bar.

5. In a sound box, the combination with a casing, of a vibratory member, a fixedly secured resilient connection between said casing and said vibratory member, a stylus bar and a second fixedly secured resilient connection between said stylus bar and said vibratory member, said last mentioned resilient connection being more sensitive than said first mentioned resilient connection.

6. In a sound box, the combination with

a casing, of a corrugated diaphragm carried thereby, a vibratory member, a stylus bar, a fixedly secured resilient connection between said vibratory member and said casing, and a resilient connection between said stylus bar and said vibratory member, the said second-named resilient connection being less rigid than the first-named of said connections.

7. In a sound box, the combination with a casing, a concentrically corrugated diaphragm, a vibratory member, a resilient connection between said vibratory member and said casing, a stylus bar, and a resilient connection between said stylus bar and said vibratory member.

8. In a sound box, the combination with a casing, of a concentrically corrugated diaphragm carried thereby, a vibratory member, a resilient connection between said vibratory member and said casing, a stylus bar connected to said diaphragm, and a resilient connection between said bar and said vibratory member, said bar connected to said diaphragm through a tapering outwardly curved resilient portion of said bar.

9. The combination of a casing, with a stylus bar, an oscillatory mounting therefor, said mounting being resiliently secured to said casing and a resilient connection between said bar and said mounting, said connection being fixedly secured to each of said connected members.

10. In a sound box, a concentrically corrugated vibratory sound producing member, means for supporting the same, means for supporting a reproducing stylus connected resiliently with said vibratory sound producing member, and a member connected by a fixedly secured resilient member to said means for supporting the vibratory member and upon which the means for supporting the reproducing stylus is resiliently mounted.

11. In a sound box the combination of a

recessed casing with a concentrically corrugated diaphragm mounted therein, an annular vibratory member mounted concentrically with said casing and having a central aperture therein, a fixedly secured resilient connection between said casing and said member, a stylus bar mounted adjacent the periphery of said member extending inwardly, through said aperture and removably connected to said diaphragm, and a second fixedly secured resilient connection securing said stylus bar and said vibratory member to a point diametrically opposite said first-named connection.

12. In a sound box, a casing, a concentrically corrugated diaphragm carried thereby, a vibratory member resiliently secured at one side thereof to said casing and having a central aperture therein, and a stylus bar resiliently secured to said vibratory member at a point opposite to the connection between said vibratory member and said casing, said stylus bar extending through said aperture and secured to said diaphragm.

13. In a sound box, the combination of a casing, with a vibratory member, a resilient connection fixedly secured to said casing and said member, a stylus bar and a resilient connection fixedly secured to said member and said bar.

14. In a sound box, the combination of a casing, with a vibratory member, a resilient connection fixedly secured to said casing and said member, a stylus bar and a resilient connection fixedly secured to said member and said bar, said last-mentioned connection being more flexible than the first-named.

In witness whereof I have hereunto set my hand this 7th day of February, A. D. 1910.

JOHN C. ENGLISH.

Witnesses:

FRANK B. MIDDLETON, Jr.,
HENRY ROBT. KENNEDY.

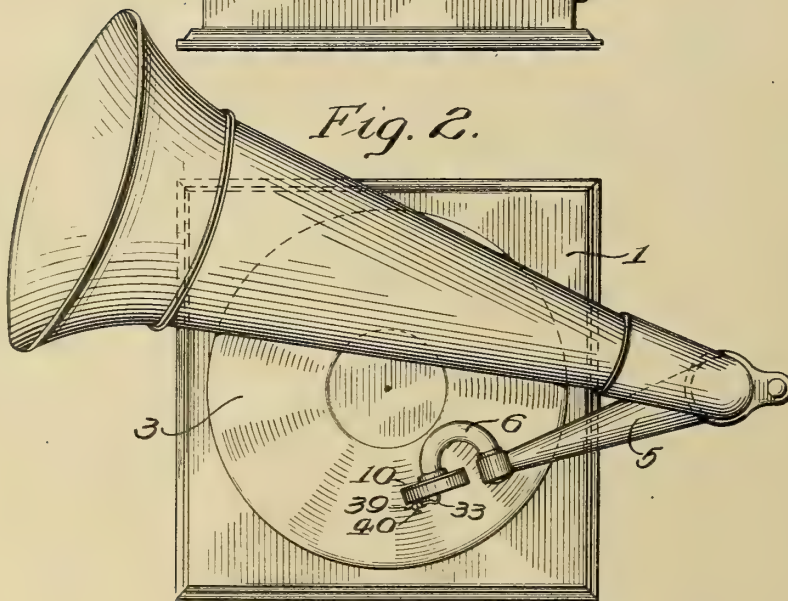
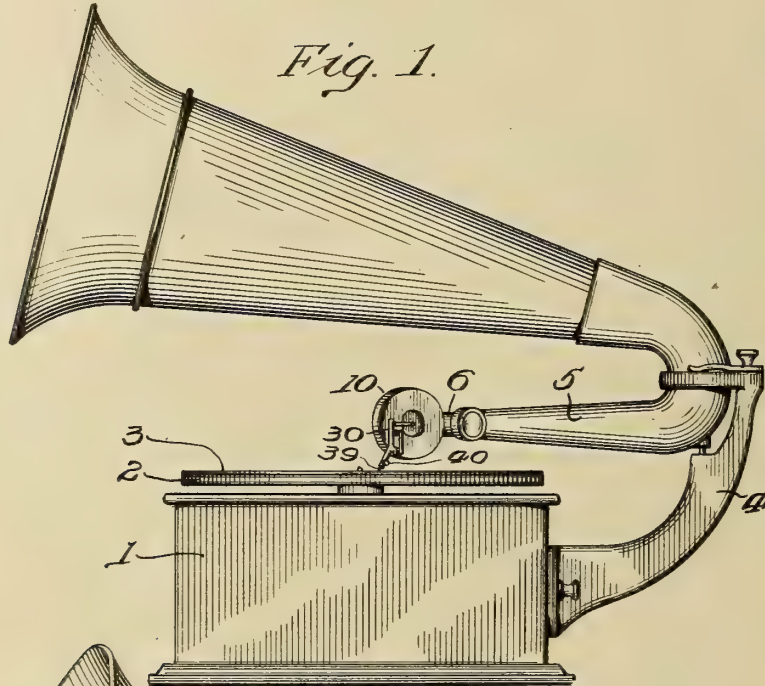


J. C. ENGLISH.
SOUND BOX FOR TALKING MACHINES.
APPLICATION FILED OCT. 27, 1908.

1,001,004.

Patented Aug. 22, 1911.

3 SHEETS—SHEET 1.



WITNESSES
F. J. Hartman.
A. D. Gardner.

BY

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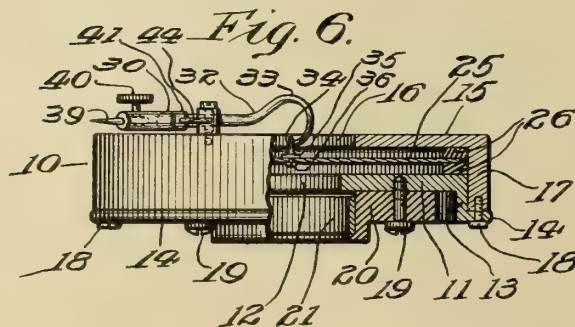
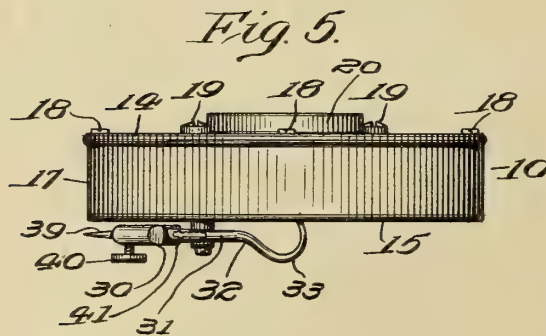
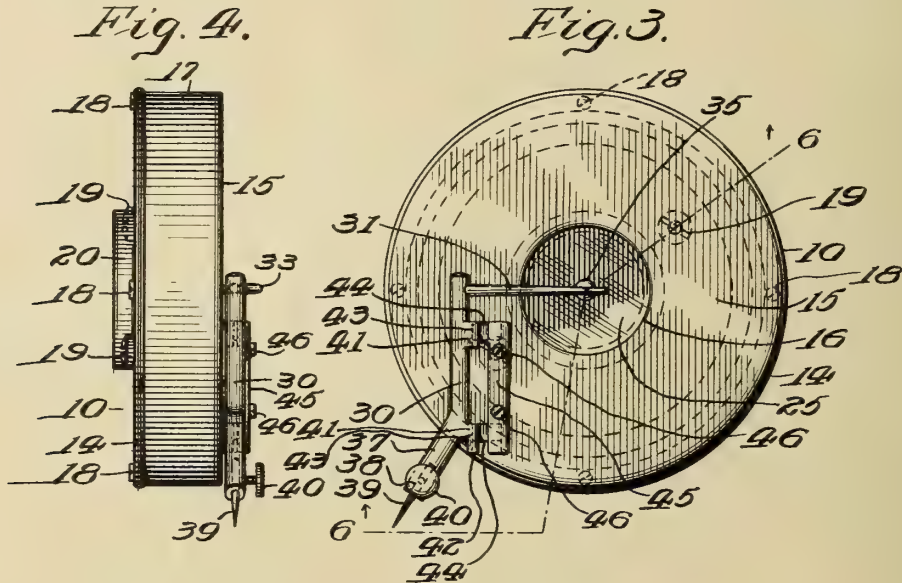


J. C. ENGLISH.
SOUND BOX FOR TALKING MACHINES.
APPLICATION FILED OCT. 27, 1908.

1,001,004.

Patented Aug. 22, 1911.

3 SHEETS-SHEET 2.



WITNESSES

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J. C. ENGLISH.
SOUND BOX FOR TALKING MACHINES.
APPLICATION FILED OCT. 27, 1908.

1,001,004.

Patented Aug. 22, 1911.

3 SHEETS-SHEET 3.

Fig. 7.

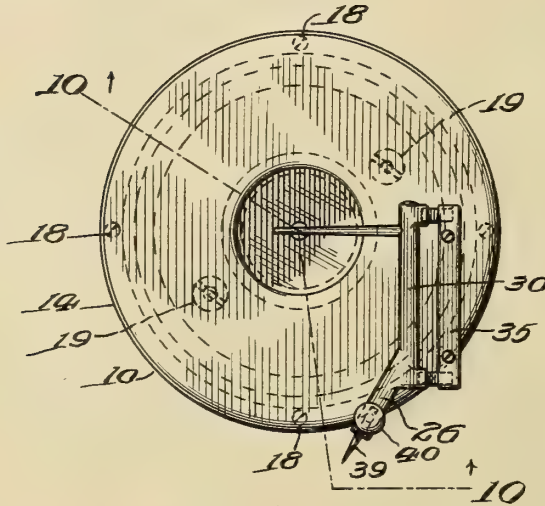


Fig. 8.

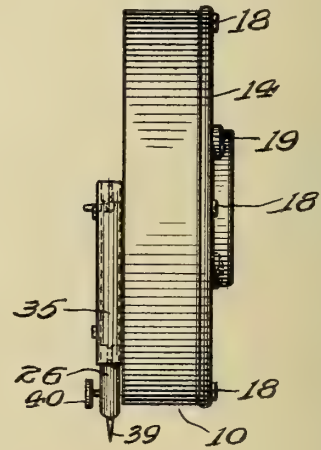


Fig. 9.

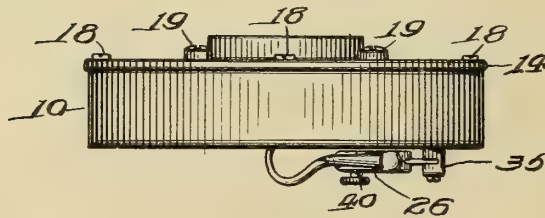
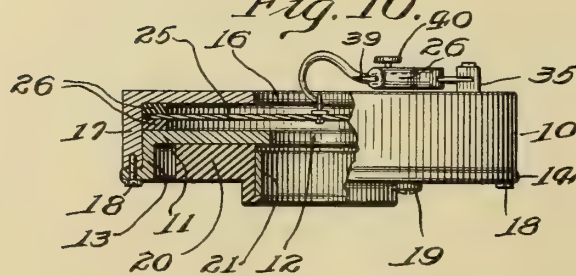


Fig. 10.



WITNESSES

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A. J. Gardner.

BY

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John C. English.

John C. English.
ATTORNEY

UNITED STATES PATENT OFFICE.

JOHN C. ENGLISH, OF CAMDEN, NEW JERSEY, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

SOUND-BOX FOR TALKING-MACHINES.

1,001,004.

Specification of Letters Patent. Patented Aug. 22, 1911.

Application filed October 27, 1908. Serial No. 459,713.

To all whom it may concern:

Be it known that I, JOHN C. ENGLISH, a citizen of the United States, and a resident of the city of Camden, county of Camden, and State of New Jersey, have invented certain new and useful Improvements in Sound-Boxes for Talking-Machines, of which the following is a full, clear, and exact disclosure, reference being had to the accompanying drawings, forming a part of this specification.

The main objects of this invention are to provide an improved sound box having a stylus bar mounted to oscillate upon an axis perpendicular to the face of the record when the bar is in operative position; to provide an improved sound box in which the diaphragm may be removed from the box without disconnecting the stylus bar from its mounting; to provide an improved stylus bar and mounting therefor; and to provide other improvements as will appear herein after.

In the drawings, Figure 1 is a side elevation of a talking machine constructed in accordance with this invention; Fig. 2 a top plan view of the same with the amplifier shifted; Fig. 3 a front elevation of a sound box constructed in accordance with this invention; Fig. 4 a side elevation of the same; Fig. 5 a top plan view; and Fig. 6 a bottom plan view of the same partially in section on the line 6-6 of Fig. 3; Fig. 7 a modified form of the sound box of this invention; Figs. 8, 9 and 10 are respectively a side elevation, a top plan view, and a bottom plan view partly in section, on line 10-10 of Fig. 7, of the same.

Referring to the drawings, the preferred embodiment of this invention comprises the usual cabinet or casing 1, carrying a substantially horizontal record support 2, rotated by the usual mechanism within the casing to turn the record 3, which is of the disk type, having laterally undulating sound grooves of uniform depth. The bracket 4, rigid with the casing, the radial hollow tapering sound box arm 5, supported at one end by the bracket 4, to swing in a plane parallel to the face of the record, and the tubular goose neck 6, pivoted upon an axis parallel to the face of the record to the free

end of the radial arm and communicating therewith, are of well-known construction.

The preferred form of sound box 10, used in this invention, and shown in Figs. 1 to 6, comprises a casing of well-known construction, including a circular back plate 11 having the usual central circular aperture 12, and having a rearwardly extending cylindrical peripheral flange 13, the rear edge of which is provided with an outwardly extending flange 14. The cover 15 of the casing has a central aperture 16, slightly greater in diameter than the central aperture 12 of the back plate, and is provided with a rearwardly extending peripheral flange 17, the rear portion of which telescopes over the back plate 11, and fits snugly in the recess formed between the flanges 13 and 14 of the back plate, being secured in position by means of screws 18, which pass through the outwardly extending flange 14 of the back plate and into the rear edge of the flange 17 of the cover. Secured to the rear face of the back of the box by means of the screws 19 is the usual yielding tubular extension 20, of rubber or other similar material, having a non-yielding lining 21, of brass or other similar metal, whereby the sound box is telescopically connected over the outer end of the tubular support 6. In the sound box the usual diaphragm 25 is mounted between annular gaskets 26, which are held in position between the back and cover of the casing, the diaphragm being in a plane substantially perpendicular to the face of the record, and being substantially midway between the front and inner surfaces of the casing, thus forming chambers of substantially similar form and equal capacity on each side of the diaphragm.

The stylus bar, as shown in its operative position in Fig. 1 and 2 of the drawing, and as shown in detail in Figs. 3 to 6, comprises a substantially vertical rigid intermediate portion 30, which extends over the lower portion of the front of the cover of the box, being spaced slightly therefrom. Integral with the upper end of this vertical portion is a slightly yielding resilient arm 31, which tapers inwardly, and which extends in a horizontal plane to a point 32 spaced between the vertical portion of the

bar and the center of the diaphragm, then curves away from the face of the box 33 to a point substantially opposite the center of the box, then curves toward the face of the box, forming a loop projecting laterally beyond the center of the box, and terminates adjacent the center of the diaphragm in a short stud 34 integral with the bar extending axially of the box, and having an enlarged inner end 35, which is secured against the outer surface of the diaphragm by means of a screw 36 through the diaphragm, or in any other suitable manner. It has been found that the comparatively slender tapering and curved construction of the arm 31, connecting the upper end of the stylus bar to the diaphragm gives better results in the reproduction of sound than would be obtained were the arm more nearly straight and rigid. The lower end 37 of the vertical portion of the stylus bar is turned downwardly and laterally outward in an oblique direction, and is provided with the usual socket 38 for the reception of the stylus 39, which is held in position by the thumb screw 40. For mounting the stylus bar, to oscillate upon a vertical axis perpendicular to the face of the record or record support, the vertical central portion of the bar 30 is provided with a pair of inwardly extending spaced lugs 41, which are positioned at the lower end and adjacent the upper end of the vertical portion of the bar respectively, the lower lug having a downwardly projecting portion 42. These lugs are provided upon their inner surfaces with slots 43, in vertical alinement and in a plane normally substantially parallel to the face of the box, in each of which is secured one end of a yielding connection 44, which preferably consists of a flat piece of tempered steel, but which may be made of any other yielding material, such as copper, or fabric of any sort. The ends of these yielding connections are brazed or fastened in place by any suitable means. For connecting the stylus bar to the cover of the sound box, a vertical cleat or rib 45 is secured to the face of the cover by means of screws 46. This rib is of a length equal to the distance from the lower end of the lower lug 41 of the stylus bar to the upper edge of the upper yielding connection of the bar, and the cleat is provided with longitudinal slots corresponding to and in alinement with the slots of the bar respectively, to receive the inner ends of the spaced yielding connections which are rigidly secured in place. This cleat is substantially parallel to the vertical central portion 30 of the bar, and the adjacent edges of the cleat and ends of the lugs 41 upon the bar are in close proximity.

The modified form of sound box constructed in accordance with this invention, shown in Figs. 7 to 10, is similar in construction to

that already described, but the stylus bar and its mounting are located upon the right-hand side of the front of the box instead of upon the left-hand side, as in the form first described. In this modified form, the stylus bar is between the center of the diaphragm and the vertical cleat 35, upon which the bar is mounted, and the lower end 26 of the bar extends obliquely downward and toward the central vertical plane of the sound box, thus bringing the free end of the stylus approximately beneath the center of gravity of the box, whereas in the first form described, the free end of the stylus diverges away from the central vertical plane of the box, and is at a greater distance from the plane.

This improved sound box in either form shown is adapted to be used either with a disk or cylindrical record having a laterally undulating sound groove or ridge of uniform depth or height, and in either case the box is mounted so that the axis of oscillation of the stylus is, at all times when the sound box is in its operative position, substantially perpendicular to the plane tangent to the face of the record at the point of contact of the stylus. The stylus bar is thus held at all times when in operation rigidly against being caused to oscillate on its axis by any pressure on the stylus perpendicular to the plane of the record at its point of contact, such, for instance, as would be caused by the weight of the sound box, but is permitted to respond readily to any lateral pressure.

By this construction of a talking machine, the false and unpleasant vibrations heretofore audible in the reproduction of sound are largely eliminated, and the reproduction is rendered with a very close approach to perfection.

Having thus described my invention, what I claim and desire to protect by Letters Patent of the United States is:

1. In a sound box, a casing having a back plate and a removable cover, and a stylus bar mounted on spaced flexible supports extending longitudinally of said bar, and carried by said cover.

2. In a sound box, a casing having a back plate and a removable cover, a diaphragm between said plate and cover, an elongated cleat on said cover and a stylus bar mounted by means of spaced flexible supports on said cleat, said supports being disposed in alinement on said cover.

3. In a sound box, the combination with a casing having a removable cover, an elongated cleat secured to said cover, of a stylus bar mounted by means of spaced flexible supports on said cleat, said supports being disposed in a plane with the axis of said stylus bar.

4. In a sound box, the combination with a

stylus bar, of flexible supports therefor spaced in longitudinal alinement at one side thereof.

5 In a sound box, the combination with a stylus bar, of flexible supports therefor spaced longitudinally thereof.

6. In a sound box, a stylus bar having an intermediate rigid longitudinal portion, and pliant supports for said bar spaced longitudinally of said portion.

7. In a sound box, a diaphragm, a stylus bar having an intermediate rigid longitudinal portion, and pliant supports for said bar spaced longitudinally of said portion, preventing oscillation of said bar in a plane parallel with said diaphragm, but permitting free vibration in a direction transverse thereto.

8. In a sound box, the combination with a diaphragm, of a stylus bar having an intermediate rigid longitudinal portion, a yielding connection between one end of said portion and said diaphragm, means for supporting a stylus at the other end of said portion, and spaced pliant supports for said bar so arranged as to prevent pressure on said diaphragm due to the weight of said box.

9. In a sound box, the combination with a diaphragm, of a stylus bar having an intermediate rigid longitudinal portion, a yielding connection between one end of said portion and said diaphragm, means for supporting a stylus at the other end of said portion, and flexible supports for said bar spaced longitudinally of said intermediate portion.

10. In a sound box, the combination with a diaphragm, of a stylus bar having an intermediate rigid longitudinal portion, a yielding connection between one end of said portion and said diaphragm, means for supporting a stylus at the other end of said portion, and spring supports for said bar spaced longitudinally of said intermediate portion.

11. In a sound box, the combination comprising a casing, a diaphragm, a single elongated cleat secured to said casing, a stylus bar having an intermediate rigid longitudinal portion, a tapering curved resilient connection between one end of said portion and said diaphragm, means at the other end of said portion for carrying a stylus, and aligned pliant means resiliently securing said bar to said cleat, said pliant means extending from one side of said cleat to one side of said bar and maintaining said bar substantially parallel with said diaphragm.

12. In sound producing mechanism, the combination with a casing, of means within said casing arranged to produce sound, a stylus bar, pliant supports for said bar connected by means of a cleat parallel there-

with and on one side thereof to said casing and extending in a plane with the axis of said bar, and an arm connecting said stylus bar and said sound producing means.

13. In sound reproducing mechanism, the combination with a casing, of means within said casing arranged to reproduce sound, a stylus bar, spaced pliant supports on one side of said stylus bar detachably connected with said casing and adjustable in a plane parallel with said sound reproducing means, and an arm detachably connecting said bar and said sound reproducing means.

14. In sound reproducing mechanism, the combination with a sound box arranged to be supported in coöperative relation with a sound record disk, of a diaphragm operatively mounted in said sound box, a stylus bar provided with flexible supporting means in vibratory relation with said box and arranged to be supported thereby to vibrate on an axis perpendicular to said sound record disk, and a stylus needle extending in oblique relation with respect to the axis of said stylus bar and arranged to operatively engage said sound record disk and vibrate said diaphragm.

15. In sound reproducing mechanism, the combination with a casing, of a diaphragm operatively mounted in said casing, a stylus bar having spaced flexible supports projecting from one side thereof, detachably engaged in rigid relation with said casing and having its axis of vibration perpendicularly disposed, a tapering resilient arm extending from said stylus bar to said diaphragm, and means arranged to detachably secure said arm to said diaphragm.

16. In sound reproducing mechanism the combination with a sound box arranged to be supported in coöperative relation with actuating means, of means within said box arranged to produce sound, a stylus bar flexibly supported from one side thereof with respect to said box and having its axis of vibration substantially parallel with a perpendicular to said actuating means, a detachably secured connection between said bar and the sound producing mechanism in said box, and a stylus needle carried by said bar arranged to coöperate with said actuating means.

17. In a sound box, the combination with a diaphragm, of a stylus bar, plane flexible supports for said bar secured to a cleat or standard on one side of said bar, spaced apart and extending in the same plane substantially parallel with said diaphragm, preventing pressure on said diaphragm other than the normal vibrations.

18. In a sound box, the combination with a diaphragm, of a stylus bar having a rigid portion provided with an obliquely projecting extension, a stylus needle carried by said extension, plane flexible supports for said

bar secured to a cleat spaced apart and disposed in vertical alinement substantially parallel with said diaphragm and preventing the movement of said stylus bar relative
5 to said diaphragm other than its normal vibratory movement.

In witness whereof, I have hereunto set

my hand this 26th day of October, A. D., 1908.

JOHN C. ENGLISH.

Witnesses:

ALSTON B. MOULTON,
ALEXANDER PARK.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."



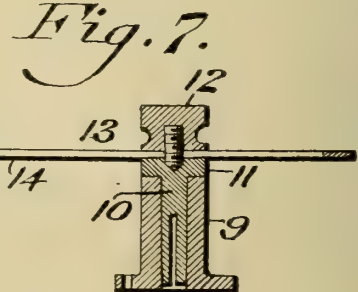
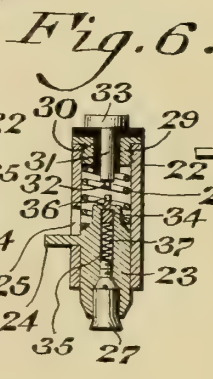
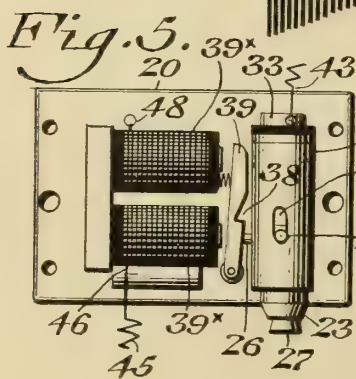
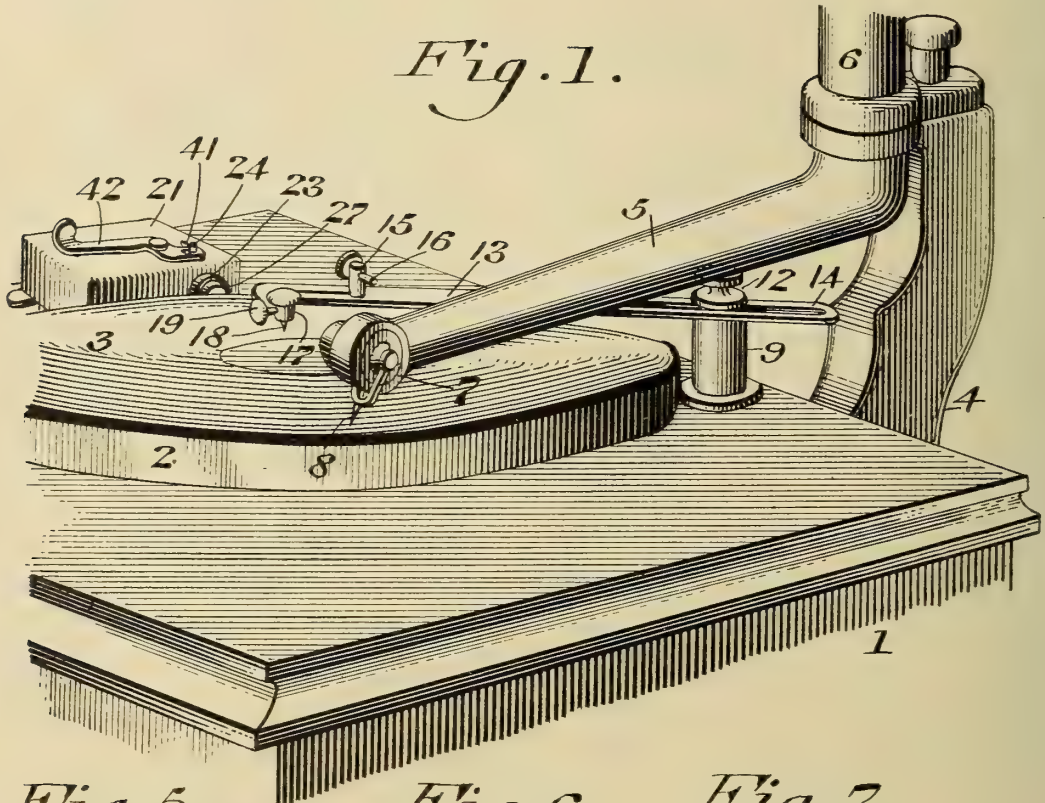
F. W. SCHMIDT.
ATTACHMENT FOR TALKING MACHINES.
APPLICATION FILED MAR. 8, 1911.

1,001,171.

Patented Aug. 22, 1911.

2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

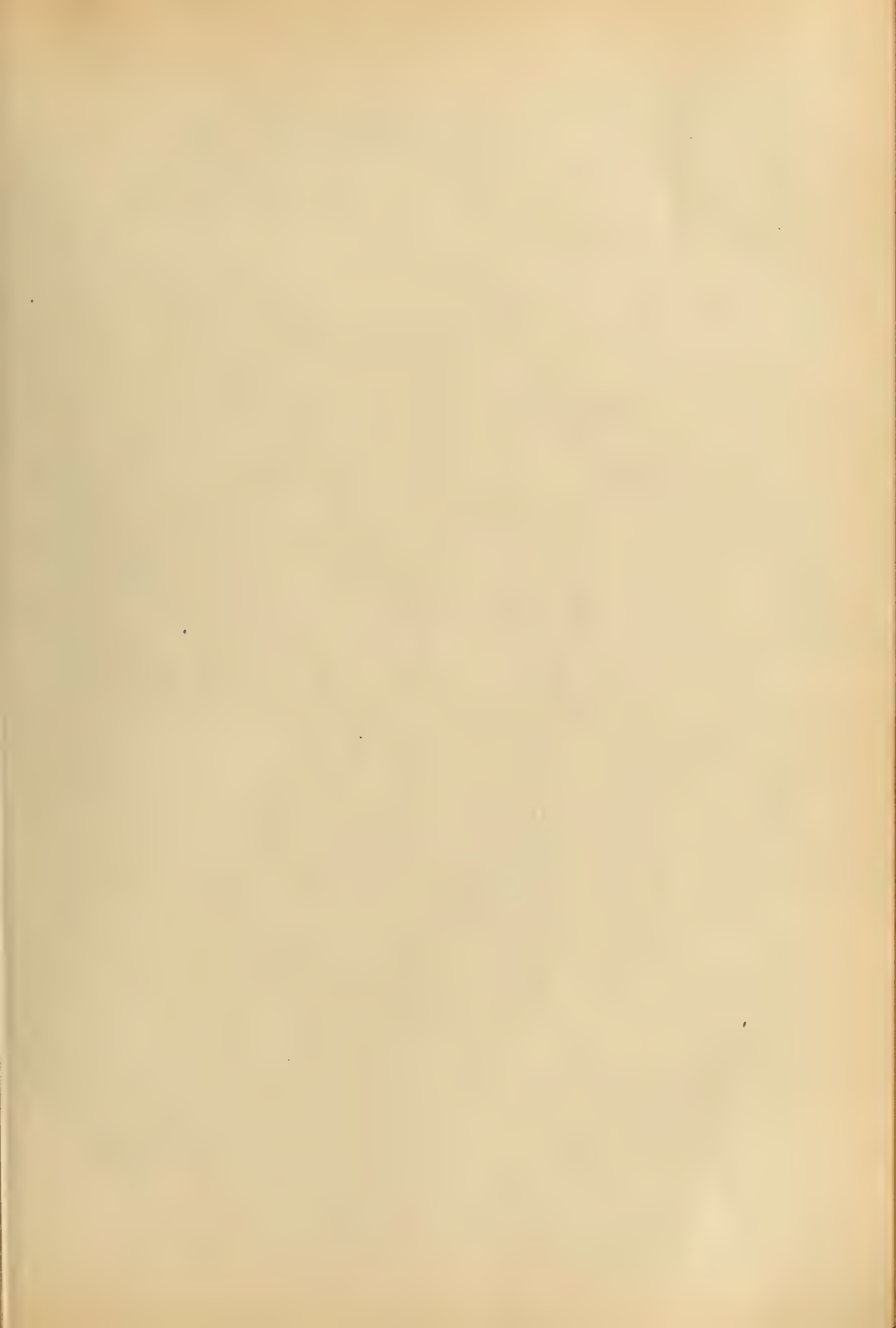
P. F. Nagle.
L. Douville.

INVENTOR

BY

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Wiedersheim & Fairbanks.

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ATTACHMENT FOR TALKING MACHINES.
APPLICATION FILED MAR. 8, 1911.

1,001,171.

Patented Aug. 22, 1911.

2 SHEETS—SHEET 2.

Fig. 3.

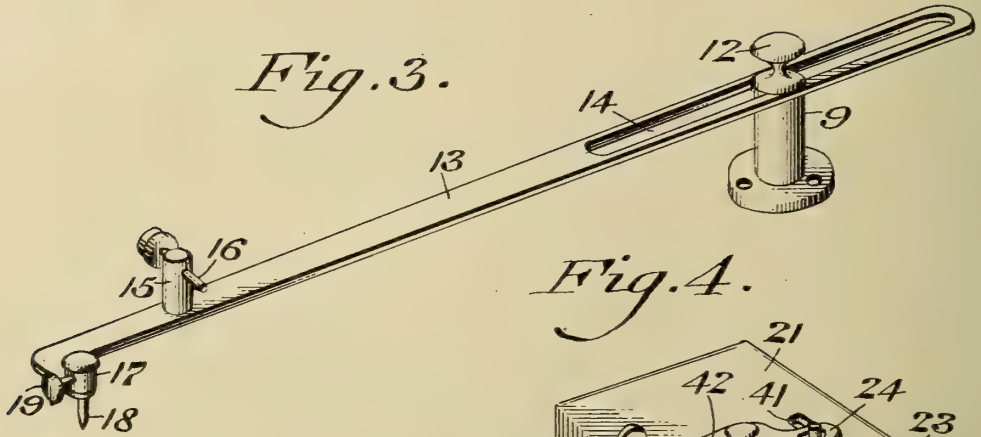


Fig. 4.

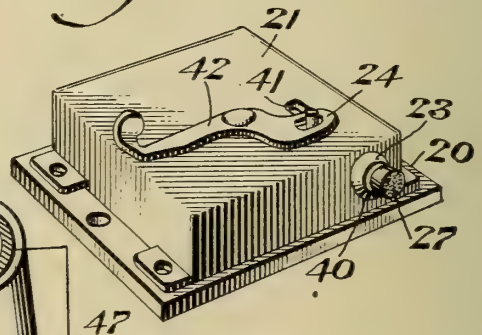
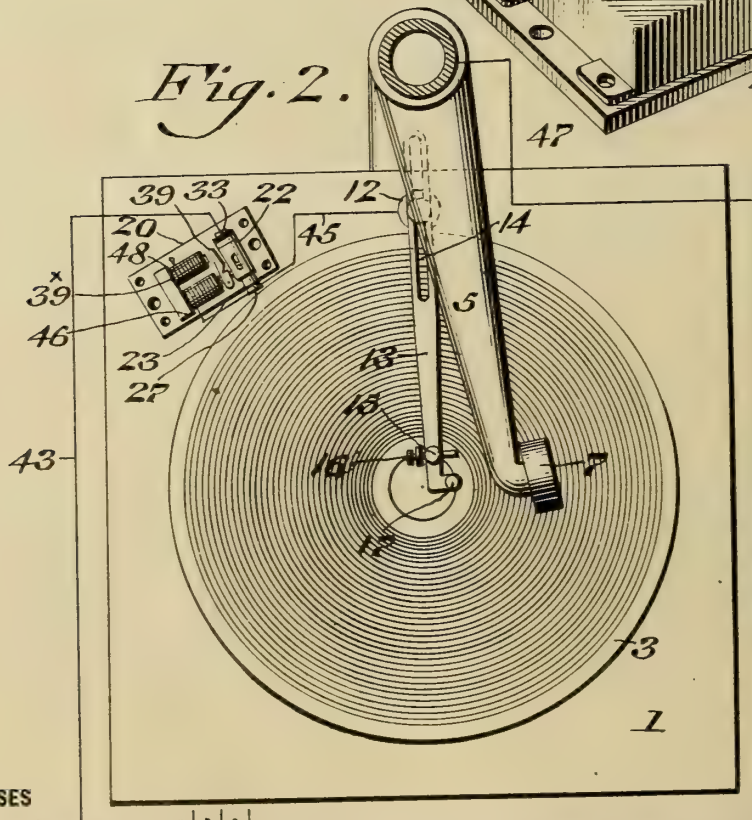


Fig. 2.



WITNESSES

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L. Douville.

INVENTOR

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Wiedersheim & Fairbanks.

ATTORNEYS

UNITED STATES PATENT OFFICE.

FREDERICK W. SCHMIDT, OF PHILADELPHIA, PENNSYLVANIA.

ATTACHMENT FOR TALKING-MACHINES.

1,001,171.

Specification of Letters Patent. Patented Aug. 22, 1911.

Application filed March 8, 1911. Serial No. 613,028.

To all whom it may concern:

Be it known that I, FREDERICK W. SCHMIDT, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Attachment for Talking-Machines, of which the following is a specification.

My invention consists of an improved attachment for sound reproducing machines, whereby the machine is stopped when the stylus arrives at the end of the groove in the record.

It further consists of such apparatus which may be attached to a talking machine without requiring records of special construction.

It further consists of other novel features of construction, all as will be hereinafter fully set forth.

For the purpose of illustrating my invention, I have shown in the accompanying drawings one form thereof which is at present preferred by me, since the same has been found in practice to give satisfactory and reliable results, although it is to be understood that the various instrumentalities of which my invention consists can be variously arranged and organized and that my invention is not limited to the precise arrangement and organization of these instrumentalities as herein shown and described.

Figure 1 represents a perspective view of as much of a talking machine as will illustrate the application of my invention to the same. Fig. 2 represents a diagrammatic plan view of the tone-tube, sound-box, turntable and record of a talking machine, illustrating my improvement in place and diagrammatically illustrating the electrical connections. Fig. 3 represents a perspective view of the slotted finder bar of my attachment. Fig. 4 represents a perspective view of the brake box. Fig. 5 represents a plan view of the brake-mechanism. Fig. 6 represents an axial section of the brake-cylinder, brake-block and contacts. Fig. 7 represents a vertical section of the post upon which the slotted bar is adjustably secured.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to the drawings, the numeral 1 indicates the cabinet of a talking machine, upon the top of which is the record carrier or turntable, 2, carrying the record, 3. A

bracket, 4, projects upward from one side of the cabinet and carries the tapering tone-tube, 5, and the horn-elbow, 6. A sound-box, 7, is supported at the free end of the tone tube, and suitably carries the stylus or needle, 8. All of these parts are of the usual or of any suitable construction, such as found in the well-known forms of talking machines.

A hollow post, 9, is secured upon the top of the cabinet, and a split plug, 10, having a shouldered head, 11, fits in the bore of said post. A clamping thumb-screw, 12, is threaded into the top of the head of the plug, and serves to clamp a flat finder bar, 13, having a longitudinal slot, 14, with which it is movable upon the shank of the screw. Near its free end, this flat bar carries a stud, 15, through which passes a contact screw, 16. The outer end of the flat bar projects laterally, in L-shape, and a head, 17, is provided at the extreme of the L, and has a needle, 18, secured in it by a set-screw, 19.

A base-plate, 20, is secured upon the top of the cabinet and to one side of the turntable, and has a cover, 21, forming a rectangular brake-box. A brake-cylinder or casing, 22, is secured upon said base-plate and in electrical contact with the same, and a plunger, 23, fits to slide within it and has a pin, 24, projecting through a slot, 25, in the upper side of the brake cylinder, and a laterally projecting tooth, 26, which projects through a longitudinal slot in the side of the cylinder. A brake-plug, 27, of leather, fiber, or other suitable material, fits in a socket in the end of the piston, to engage the rim of the turntable to stop its rotation when the piston is forced outward by a coiled spring, 28, within the bore of the cylinder and bearing against the piston. The opposite end of the brake-cylinder is closed by a plug, 29, which confines the spring and a flanged sleeve, 30, of insulating material fits in an axial bore in said plug. A pin, 31, fits in the bore of this sleeve and has a contact-point, 32, upon its inner end and a head, 33, upon its outer end. A headed pin, 34, has play in an axial bore, 35, in the brake piston, and is held from slipping out at the inner end of said bore by the latter having a contracted inner end. Said headed pin has a contact point, 36, at its end which registers with and is opposed

to the contact-point of the stationary pin, and a spring, 37, serves to force the head of the movable pin against the contracted end of the bore. The laterally projecting tooth upon the brake-piston will engage a detent-notch, 38, in the armature, 39, of electro-magnets, 39*, when the brake-piston is moved inward. The cover for the brake-mechanism has an opening, 40, in its side, through which the end of the brake-piston and its plug may project, and a slot, 41, in its top, through which the upright pin upon the brake-piston projects and in which it slides. The end of this pin is engaged by a slot in the end of a thumb-lever, 42, pivoted upon the cover, and by means of which lever the brake may be set.

One terminal, 43, of a battery, 44, is connected to the head of the stationary contact pin in the brake-cylinder, and the other terminal, 47, is connected to the tone-tube of the talking machine. The slotted bar and its post is connected by a wire, 45, to one terminal, 46, of the magnet windings, and the other terminal is grounded, at 48, to the base-plate of the brake-mechanism and thus to the brake-cylinder and piston.

In practice, the slotted finder bar is adjusted by means of the clamp-screw to bring the pin above the blank central space of the record. When a record is placed on the turn-table, the finder bar is moved laterally until the needle at the end of the bar can engage the end of the last groove upon the record when depressed, the needle being normally out of contact with the record. As now the sound-box and tone-tube are moved inward by the needle following the spiral groove in the record, the sound-box will at last make contact with the contact screw upon the bar, as the needle reaches the end of the groove. This will close the circuit through the tone-tube and slotted arm, causing the circuit to pass from the battery, through the wire, 47, to the tone-tube and sound-box, through the contact-screw and slotted arm and the wire 45 to the electro-magnets. As the brake-piston and plug have been retracted into the cylinder by means of the thumb-lever, the stationary and yielding contacts are in contact, so that the current passes through the magnet windings, through the base-plate, through the brake-cylinder, piston and contacts and back to the battery through the insulated stationary contact and wire, 43. The magnets are thus energized and attract their armature, releasing the brake-piston which flies out and engages and stops the turntable, while, at the same time, the circuit is broken, even though the sound-box and the contact screw remain in contact. The yielding contact in the brake-cylinder admits of the points remaining in contact and the current remaining unbroken after the brake-piston has started

forward, thereby preventing the armature from being released until after the tooth on the brake-piston has fully cleared the detent-notch in the armature.

By the employment of this device, a talking machine may be promptly stopped at the end of the piece it is playing, thereby preventing the hoarse and rattling sound of the needle traveling over the blank portion of the record and saving the record, without obliging the operator to watch the machine and stopping it at the end of the piece,—the action here being entirely automatic. The distance between the pointer needle and the contact screw upon the slotted arm equals that between the point of the needle on the sound-box and the point where the latter contacts with the contact screw, so that the machine may be stopped with great accuracy if the pointer needle has been set over the end of the last turn of the spiral groove in the record before the machine is started. The contact-screw may be adjusted to adapt it to make contact with different styles of sound-boxes at the proper point. After the bar has once been adjusted by means of the slot and the clamping screw, according to the size of the machine to which it is applied, and after the contact-screw has been adjusted, there will be no need for further adjustments of the bar, and all that is necessary to do when a record is changed is to bring the needle in register with the end of the groove by swinging the arm across the record until, by depressing the end of the bar, the needle strikes such groove.

While a brake for the turntable has been illustrated and described it is evident that any suitable stopping device for the machine may be substituted.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In an electrical brake for a talking machine, an adjustable finder bar carrying a contact device adapted to predetermine the actuation of the brake at the close of the reproduction automatically upon positioning of said finder bar, a sound-box arm and an electric circuit connecting said contact device and sound box arm.

2. In an electric brake for a talking machine, a normally open electric circuit having one terminal connected to the sound-box of a talking machine, a finder bar pivoted at one end upon a fixed portion of the machine to swing across the record and having at its free end a downwardly-pointing needle which may engage the record when the bar is depressed and a contact at a distance from the point of said needle equal to the distance from the point of the stylus of the sound-box to the point of the latter where it will engage such contact, said bar being connected to the other terminal of the cir-

cuit, and an electrically actuated brake device in the circuits for stopping the machine.

3. In an electric brake for a talking machine, a normally open electric circuit having one terminal connected to the sound-box of a talking machine, a finder bar pivoted at one end upon a fixed portion of the machine to swing across the record and having at its free end a downwardly-pointing needle adapted to engage the groove in the record when the arm is depressed, said bar being connected to the other terminal of the circuit, a contact-screw in said bar and adjustable to bring its point to a distance from the point of the needle equal to that between the point of the stylus in the sound-box and the point of the latter where it engages the contact-screw, and an electrically actuated brake-device in the circuit for stopping the machine.

4. In an electric brake for a talking ma-

chine, a normally open electric circuit having one terminal connected to the sound-box of a talking machine, a bar pivoted at one end upon a fixed portion of the machine to swing across the record and having at its free end a downwardly-pointing needle which may engage the record when the bar is depressed and a contact at a distance from the point of said needle equal to the distance from the point of the stylus of the sound-box to the point of the latter where it will engage such contact, said bar being connected to the other terminal of the circuit and having means for adjusting it longitudinally and for securing it in its adjustment, and an electrically actuated brake-device in the circuit for stopping the machine.

FREDERICK W. SCHMIDT.

Witnesses:

WM. CANER WIEDERSEIN,
C. D. McVAY.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

J. LOUVET.

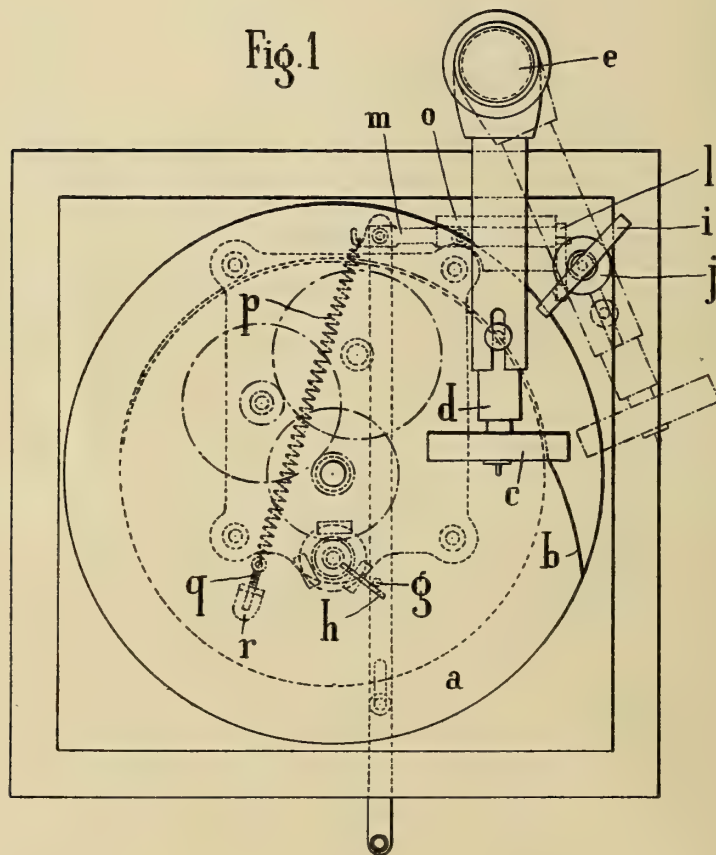
DEVICE FOR AUTOMATICALLY STOPPING THE DISKS OF TALKING MACHINES.

APPLICATION FILED MAR. 18, 1910.

1,001,418.

Patented Aug. 22, 1911.

3 SHEETS—SHEET 1.



Witnesses
M. H. Varg.
L. A. Price.

Inventor,
Jules Louvet,
By *Wm. E. Boulter*
Attorney

J. LOUVET.
 DEVICE FOR AUTOMATICALLY STOPPING THE DISKS OF TALKING MACHINES.
 APPLICATION FILED MAR. 18, 1910.

1,001,418.

Patented Aug. 22, 1911.
 3 SHEETS-SHEET 2.

Fig. 2

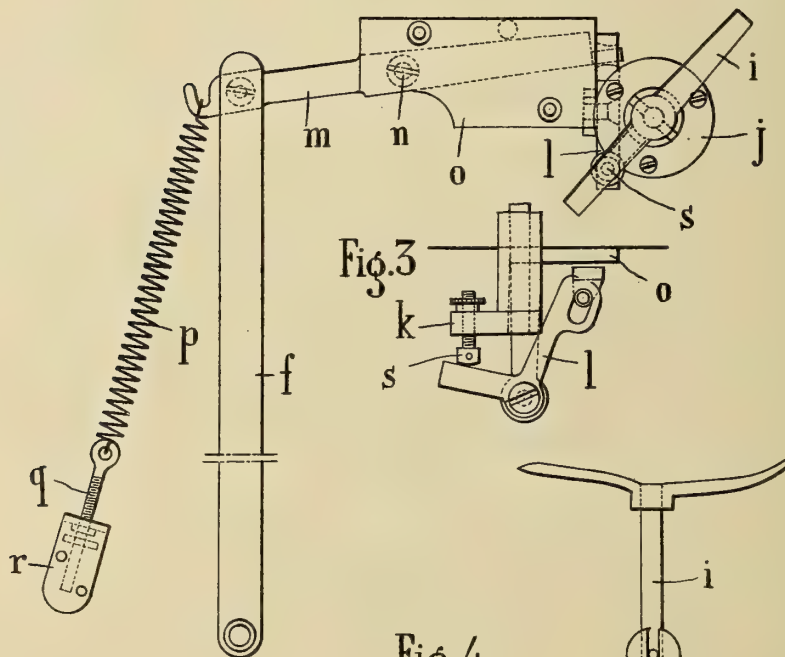


Fig. 3

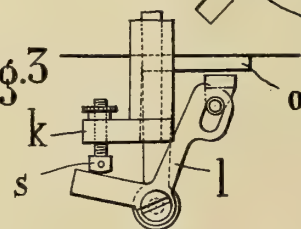
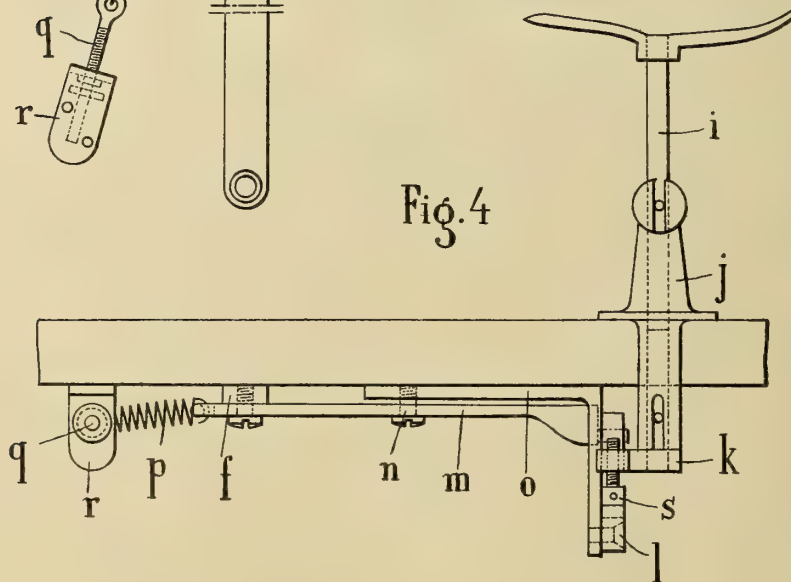


Fig. 4



Witnesses:
 M. H. Darg
 L. A. Price.

Inventor
 Jules Louvet,
 By *Wm E Boulter*,
 attorney

J. LOUVET.
 DEVICE FOR AUTOMATICALLY STOPPING THE DISKS OF TALKING MACHINES.
 APPLICATION FILED MAR. 18, 1910.

1,001,418. **Fig. 5**

Patented Aug. 22, 1911.
 3 SHEETS—SHEET 3.

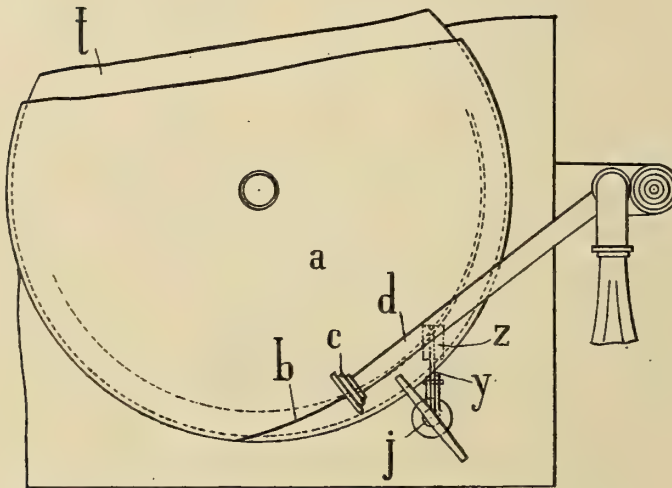


Fig. 8

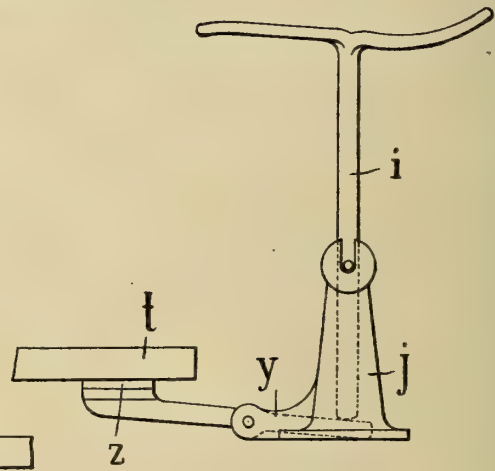
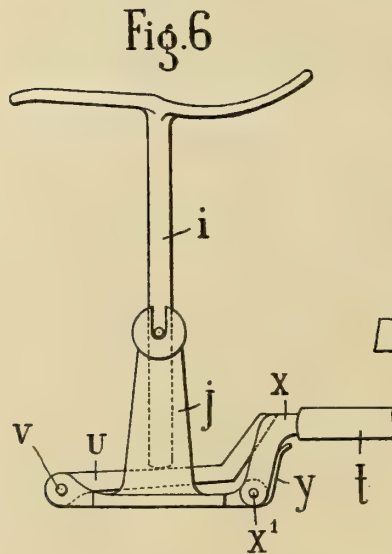
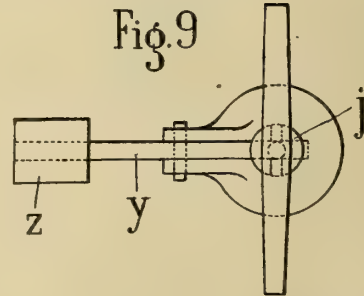
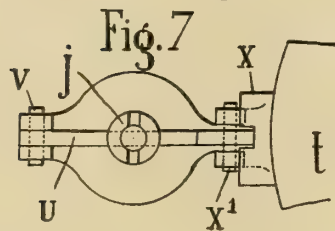


Fig. 9



Witnesses
 M. H. Darg.
 L. A. Price.

Inventor:
 Jules Louvet
 By *Thos E. Boulter*
 attorney

UNITED STATES PATENT OFFICE.

JULES LOUVET, OF MONTROUGE, FRANCE.

DEVICE FOR AUTOMATICALLY STOPPING THE DISKS OF TALKING-MACHINES.

1,001,418.

Specification of Letters Patent.

Patented Aug. 22, 1911.

Application filed March 18, 1910. Serial No. 550,190.

To all whom it may concern:

Be it known that I, JULES LOUVET, of Montrouge, Seine, France, have invented a Device for Automatically Stopping the
5 Disks of Talking-Machines, of which the following is a specification.

This invention relates to the automatic stopping of the disks of talking machines provided with a needle or a sapphire when
10 the performance is finished, this stopping arrangement being applicable in cases where the disks employed bear a record beginning near the center and finishing near the circumference. With this object, the record is
15 extended by a curved or straight groove or embossment which causes the needle or the sapphire to move outside of the disk; the sound arm then falls on to a rod and its weight actuates a brake which stops the
20 disk.

Figures 1 to 9 illustrate two different forms of the device employed. Fig. 1 is a plan of a talking machine provided with the automatic stopping device. Fig. 2 is a plan
25 of the stopping apparatus. Fig. 3 a side view of the same. Fig. 4 an end elevation. Figs. 5 to 9 illustrate a modified form of the device. Fig. 5 is a plan of a machine provided with a stopping device; Fig. 6 is a
30 side view of the brake mechanism; Fig. 7 a plan of the same; Figs. 8 and 9 being respectively an elevation and a plan of a different form of the brake.

For the purpose of insuring the automatic
35 stopping of the apparatus, the disk *a* bearing the record has, following the record, a curved or straight groove or embossment *b*, along which the needle or the sapphire, carried by the diaphragm *c* arranged on the
40 sound arm *d* that pivots at *e* in the usual manner, must move.

In the device as shown in Figs. 1 to 4 stopping is effected by automatically actuating the hand-operated stop employed in certain machines. This stoppage by hand was
45 effected by a small rod *f* furnished with a button that is pressed by the finger. On this rod a pin *g* is fixed on which another pin *h* impinges which is mounted on the regulator or governor and rotates therewith. The
50 sound arm *d* having completed its travel, that is to say finished the reproduction of the piece, is held by the sapphire in the last spiral of the record while the disk continues to rotate until the spring is completely
55 relaxed.

The automatic stopping according to the invention is effected as follows: A rod *i*, terminating in the form of a T and held in position by a pedestal *j* having a socket, receives the sound arm *d* when the piece is
60 finished, the arm *d* being moved outside by the disk *a*, under the action of the curve *b* that runs to the outer rim of the disk and along which the sapphire or the needle must
65 move at the end of the record. The sound arm *d* drops on to the T part of the rod *i* and by its weight lowers that rod. This latter exercises pressure on another rod *k* terminating in an angular piece which actuates a lever *l*. To this lever a small
70 connecting rod *m* is attached which terminates on the one hand in a pivot and on the other hand is connected with the rod *f* and imparts thereto the motion for effecting the
75 stopping, similar to that which would have been imparted with the finger. The lever *m* is flexibly connected and fixed at *n* on a support *o* which likewise supports the lever *l*.
80 To one of the ends of the connecting rod a spring *p* is attached which is put under tension by a screw *q* held by a support *r* and insures the starting of the apparatus. The regulating of the throw of the lever *l* is
85 effected by a small screw *s* mounted on the lever *l*.

In the simplified device shown in Figs. 5 to 7 the brake action is effected on the outer rim of the disk-carrying table *t*. In these
90 figures the brake is represented as in contact with the disk carrying table. The device comprises a pedestal *j*, formed with a socket in which the rod *i* is engaged the upper end or head of which is in the form of a T and receives the sound arm at the
95 required moment. The lower part of this rod *i* rests on a small lever *u* pivoting at *v* on the base of the pedestal *j*. The free end of the lever *u* rests on a piece X pivoting at X' and constituting the brake. A spring *q* pushes
100 the brake piece X back so as to allow the free rotation of the disk-carrying table *t* during the performance. When the performance is finished, the curve *b* leads the sapphire or the needle outside of the disk *a*, the
105 sound arm *d* falls on to the T head of the rod *i* and the brake X acts on the rim of the table *t*, causing it to cease rotating.

In the device as in Figs. 8 and 9, the stopping is effected through the friction of the
110 brake on the bottom of the disk-carrying table *t*. The pedestal *j* formed with a socket

carries the rod *i* as in the device described above. This rod *i* bears, at the required moment, on a lever *y* carrying a brake shoe *z* which acts on the under surface of the table
5 *z*. The part of the lever *y* where the brake shoe *z* is placed forms a counterweight and raises the rod *i* while the apparatus is in action.

What I claim is:

10 In a talking machine the combination with a rotatable disk-carrying table, a record disk carried thereby, a sound arm, and a needle carried by the latter, of a brake device comprising an arm adapted to be

brought into contact with the table, and a 15 second arm arranged to support the sound arm when the latter has been moved laterally to cause the needle to be moved off of the record disk, said second arm being operated by the weight of the sound arm to effect the 20 operation of the first arm and stop the rotation of the table and disk.

In testimony whereof I affix my signature in presence of two witnesses.

JULES LOUVET.

Witnesses:

DEAN B. MASON,
VICTOR MATRASE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

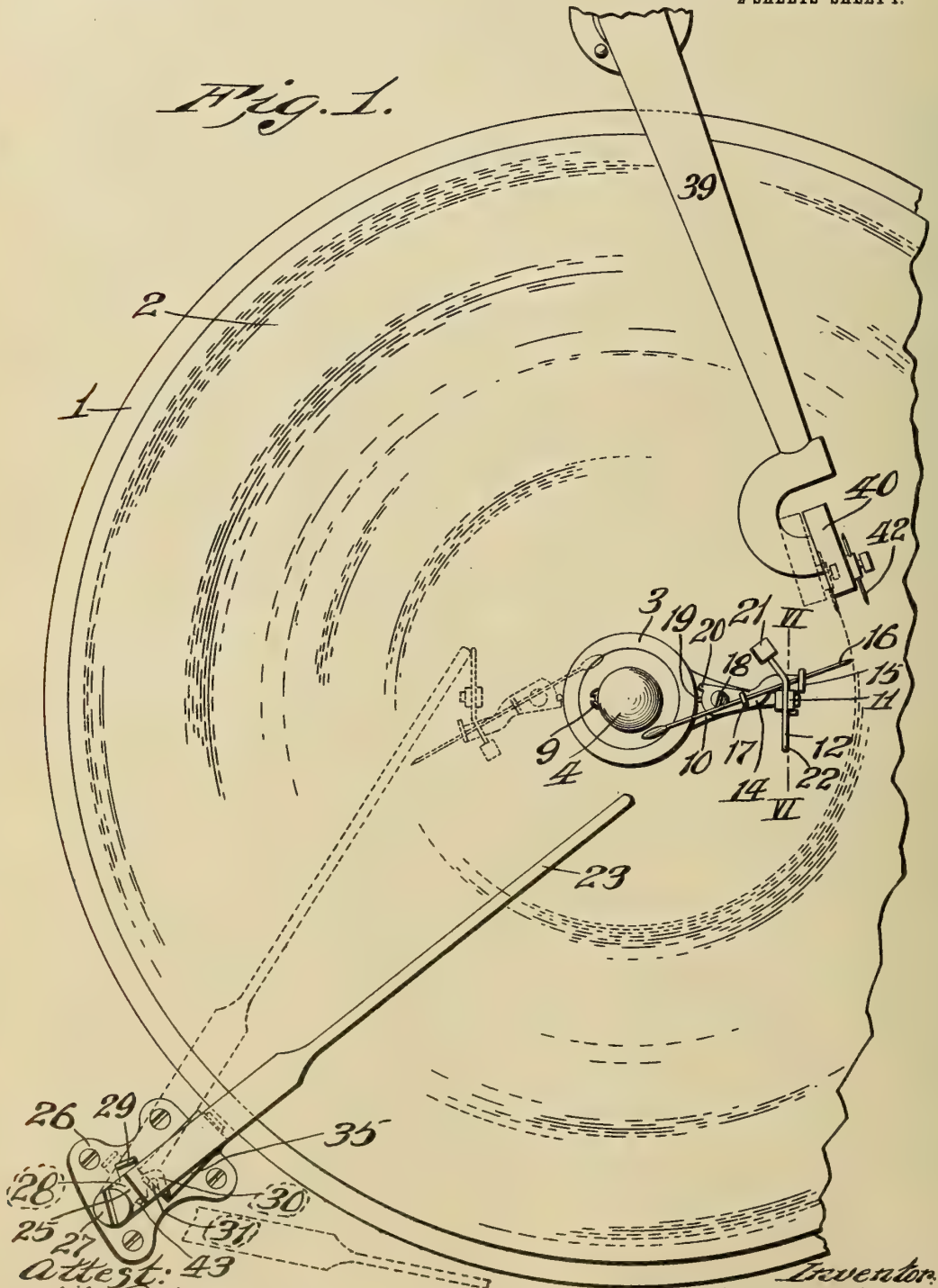
R. E. WILLIAMS.
GRAMOPHONE STOP.
APPLICATION FILED MAR. 3, 1911.

1,001,493.

Patented Aug. 22, 1911.

2 SHEETS—SHEET 1.

Fig. 1.



Attest: 43
S. G. Galt
M. C. Hammon

Inventor:
Ralph E. Williams.
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R. E. WILLIAMS.
GRAMOPHONE STOP.
APPLICATION FILED MAR. 3, 1911.

1,001,493.

Patented Aug. 22, 1911.

2 SHEETS—SHEET 2.

Fig. 2.

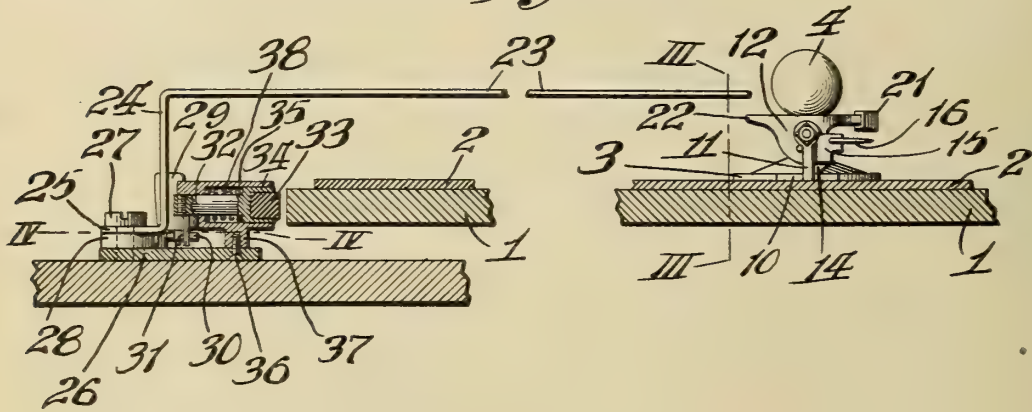


Fig. 4.

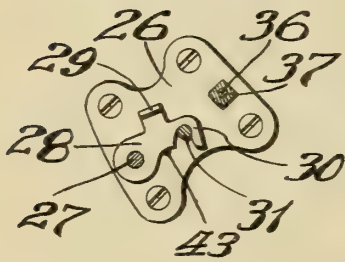


Fig. 3.

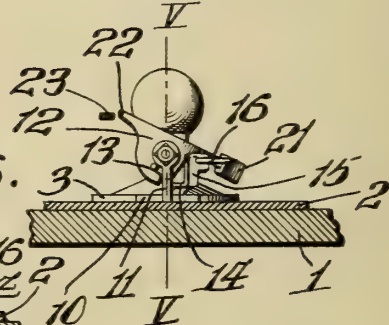


Fig. 6.

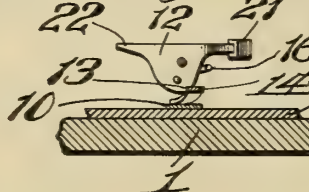
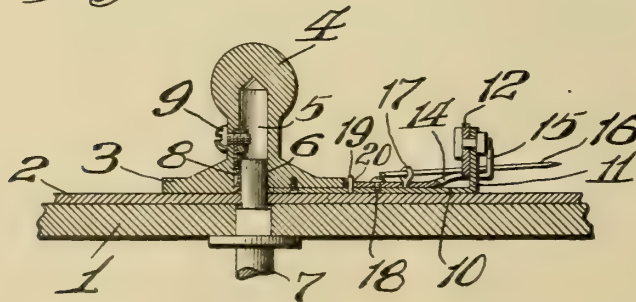


Fig. 5.



Attest:
A. G. Fletcher.
M. C. Hammon

Inventor:
Ralph E. Williams.
By *Tringham* attys.

UNITED STATES PATENT OFFICE.

RALPH E. WILLIAMS, OF ST. LOUIS, MISSOURI.

GRAMOPHONE-STOP.

1,001,493.

Specification of Letters Patent. Patented Aug. 22, 1911.

Application filed March 3, 1911. Serial No. 611,987.

To all whom it may concern:

Be it known that I, RALPH E. WILLIAMS, a citizen of the United States, residing at St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Gramophone-Stops, of which the following is a specification.

This invention relates to gramophone stops, and has for its primary object to provide an improved construction, combination and arrangement of parts in devices of this character whereby it may be adapted for use with different sized records, made very delicate in operation, and by means of which it may be readily adjusted to effect the braking action when the sound box has reached a certain point more or less distant from the center of the disk.

Other and further objects will appear in the specification, and be specifically pointed out in the appended claims, reference being had to the accompanying drawings exemplifying the invention, and in which—

Figure 1 is a plan view of a gramophone provided with my improved braking device. Fig. 2 is partial side elevation of the same, partly broken away, and parts being shown in section. Fig. 3 is a section on the line III—III, Fig. 2, showing the brake-operating mechanism in operative position. Fig. 4 is a section on the line IV—IV, Fig. 2. Fig. 5 is a fragmentary section through the axis of the turn table having a disk record mounted thereon. Fig. 6 is a section on the line VI—VI, Fig. 1.

The present invention contemplates the provision of improved means for automatically stopping a disk gramophone at the end of a selection, said means being adjustable to adapt it for use with records which end at different distances from the center and according to which a trip adjustment device is mounted adjacent the center of the disk which is operable under very delicate pressure from a part moving with the sound box, the brake being applied independently of the sound box and at the rim of the disk where it is most efficient. In carrying out these purposes of the invention, the adjustable trip comprises a durable but very delicately mounted trip lever which is weighted to throw it into position to engage a brake-releasing lever and a stop which normally maintains the trip lever in inoperative position, but which by very slight pressure from the sound box or needle carried thereby, is

moved into release position. Furthermore, my improved automatic stop can be attached without alterations to almost any of the gramophones on the market and may be applied to all the other machines by the provision of a few additional attachments, depending on the make and style of the machine.

Referring more particularly to the drawings, the turntable 1 of the gramophone has mounted thereon a disk record 2 which is retained in position by a center plate 3 provided above with an integral knob or handle 4 by means of which it may be lifted. Said center plate and knob are provided with a center bore 5 adapting it to fit over the reduced end portion 6 of the gramophone spindle 7, a clamping spring 8 being secured to the inner wall of the bore 5 by a screw 9. Projecting from the center plate 3 is a radial arm 10 provided with an upwardly deflected portion 11 which provides a pedestal or support for a tripping lever 12, said tripping lever 12 being provided with a recess forming a shoulder 13 which is normally engaged by a release lever 14 whose outer end is provided with an upwardly projecting support 15 through a perforation in which extends a rod or pin 16. The inner end of the pin 16 is supported by an eyelet 17 or other suitable means carried by the release lever 14. Said release lever 14 swings about a pivot 18 and has its movement limited by a stop pin 19 in the path of movement of a projection 20 formed on said release lever. As shown best, in Fig. 1 of the drawings, the trip lever 13 has one end deflected and provided on the extremity of that end with an enlarged portion or weight 21 which, when the release lever 14 is moved laterally in the manner to be hereinafter set forth, permits the trip lever 13 to assume the position shown in Fig. 3 in which its other end 22 in the form of a finger is elevated to a position in which it will engage the inner end of a brake-operating lever 23. Said brake operating lever 23 is provided with a downwardly projecting portion 24 with a deflected foot 25 pivotally mounted, in the present embodiment, upon a base plate 26 by means of a pivot screw 27. Pivottally mounted upon the same screw 27 is a stop engaging lever 28 having an upwardly projecting finger hold 29 and provided on its outer swinging end with a hook or cam 30 which is adapted to slidably

engage a cam pin 31 projecting downwardly from the slide bar 32 of a resiliently mounted brake pawl. Said brake pawl is adapted to impinge the periphery of the turntable 1 by having a pad 33 of rubber or other suitable material mounted in an enlarged socket head 34 which slides within a housing 35 which is radially secured to the base plate 26 by a screw 36 which projects into a depending portion 37 of said housing 35. A spring 38 serves to resiliently press the brake pawl against the turn-table 1.

In Fig. 1 of the drawings, a swingingly mounted sound tube 39 of well known construction is illustrated, provided on its outer end with a sound box 40. Depending from the sound box 40 is the usual needle 42 which travels over the record and sooner or later engages the pin 16 carried by the release lever 14, said pin 16 being constructed of any desired length corresponding to the range of diameters in the record disks.

The operation of my device will now be understood, and briefly stated is as follows: The pin 16 having been adjusted to bring its outer extremity adjacent the innermost record groove of the disk 2, the machine may be set in motion and left to run its course, the sound box needle 42 at the end of the record being brought into engagement with the pin 16 and serving to displace the release lever 14 by that means. When the release lever 14 is displaced laterally, the weight 21 forces the trip lever 12 into operative position in which the finger 22 thereon will be brought into engagement with the brake-operating lever 23 causing said lever to be displaced into the position shown in dotted lines in Fig. 1. By this movement of the brake-operating lever, a pin 43 which projects downwardly from the foot 25 of the brake-operating lever, is brought into engagement with the cam lever 28 causing said lever 28 to be displaced laterally to release the hook 30 from the pin 31 on the brake pawl and permitting the spring 38 to force brake pad 33 against the periphery of the turn-table.

What I claim is:

1. In a device of the character described, the combination with a turn-table of a braking element provided with means tending to move it against the periphery of said turn-table, means for holding said braking element out of engagement with the turn-table, and means operatably connected with the last said means for causing the release of the braking element and comprising a member adjacent the center of the turn-table and revolving therewith, said member being normally in an inoperative position, and means for moving said member into operative position.

2. In a device of the character described, the combination with a turntable, a sound

box and a stop for engaging said turntable, of a lever overhanging said turntable, means carried by said turntable adjacent its axis for operating said lever, said means being movable into and out of operative position, and other means operatively related to the sound box for holding the first said means in inoperative position, said other means being displaced by a member carried by the sound box when said member has reached a predetermined position.

3. In a device of the character described, the combination with a turn-table and a sound box provided with a needle movable across said turn-table, of a resiliently mounted braking element operatively related to the periphery of said turn-table, a lever for holding said braking element out of engagement with said turn-table, another lever operatably engaging the former lever, a disk retaining member at the center of said turn-table, and means carried by said retaining member for operatably engaging the second lever, said means comprising a trip lever, and means for holding said trip lever out of operative position, the last said means being adjustable radially to engage the sound box needle at different distances from the axis of the turn-table.

4. In a device of the character described, the combination with a turn-table and a sound box movable thereacross and provided with a tracing needle, of a braking device disposed adjacent the periphery of said turn-table and having an operating lever projecting across the face of said turn-table, a center piece for holding a disk in place on said turn-table, a trip lever pivotally mounted on said center piece, said trip lever being provided with means tending to hold it in position to engage said operating lever, a stop lever movable into and out of engagement with said trip lever, and means carried by said stop lever for operatively engaging the sound box needle.

5. In a device of the character described, the combination with a turn-table and a sound box movable thereacross and provided with a tracing needle, of a braking device disposed adjacent the periphery of said turn-table and having an operating lever projecting across the face of said turn-table, a center piece for holding a disk in place on said turn-table, a trip lever pivotally mounted on said center piece, said trip lever being provided with means tending to hold it in position to engage said operating lever, a stop lever movable into and out of engagement with said trip lever, and means carried by said stop lever for operatively engaging the sound box needle, said means being adjustable toward and away from the center of said turn-table.

6. In a device of the character described, the combination with a turn-table and a

sound box suitably supported to move across
 a record disk carried by said turn-table, said
 sound box being provided with a tracing
 needle, of a resiliently mounted brake ele-
 5 ment for engaging the periphery of the
 turn-table, a cam lever for holding said
 braking element out of engagement with
 the turn-table, an operating lever adapted
 to move said cam lever out of engagement
 10 with the braking element, said operating
 lever being disposed across the face of said
 turn-table, a disk-retaining center piece ro-
 tatable with said turn-table, a trip lever car-
 ried by said center piece, said trip lever be-
 15 ing weighted to normally hold it in a po-
 sition for engaging said operating lever, a
 stop lever normally holding said tripping
 lever out of operative position, and a pin
 carried by said stop lever and adapted to
 20 be engaged by the sound box needle.

7. In a device of the character described,
 the combination with a turn-table and a
 sound box suitably supported to move across
 a record disk carried by said turn-table,
 25 said sound box being provided with a trac-
 ing needle, of a resiliently mounted brake
 element for engaging the periphery of the
 turn-table, a cam lever for holding said
 braking element out of engagement with the

turn-table, an operating lever adapted to 30
 move said cam lever out of engagement with
 the braking element, said operating lever
 being disposed across the face of said turn-
 table, a disk retaining center piece rotatable
 with said turn-table, a trip lever carried by 35
 said center piece, said trip lever being
 weighted to normally hold it in a position
 for engaging said operating lever, a stop
 lever normally holding said tripping lever
 out of operative position, and a pin carried 40
 by said stop lever, said pin being slidably
 mounted to adapt it to engage the sound box
 needle at different distances from the center.

8. In a device of the character described,
 the combination with a turn-table, and a 45
 braking device having a member supported
 adjacent the periphery of, and overhanging,
 said turntable, of a sound box provided with
 a tracing needle and means revolving with
 said turn-table for operating said member, 50
 said means being provided with an element
 adjustable to and from the center of the
 turn-table to intercept the tracing needle at
 any desired distance from the center.

RALPH E. WILLIAMS.

In the presence of—

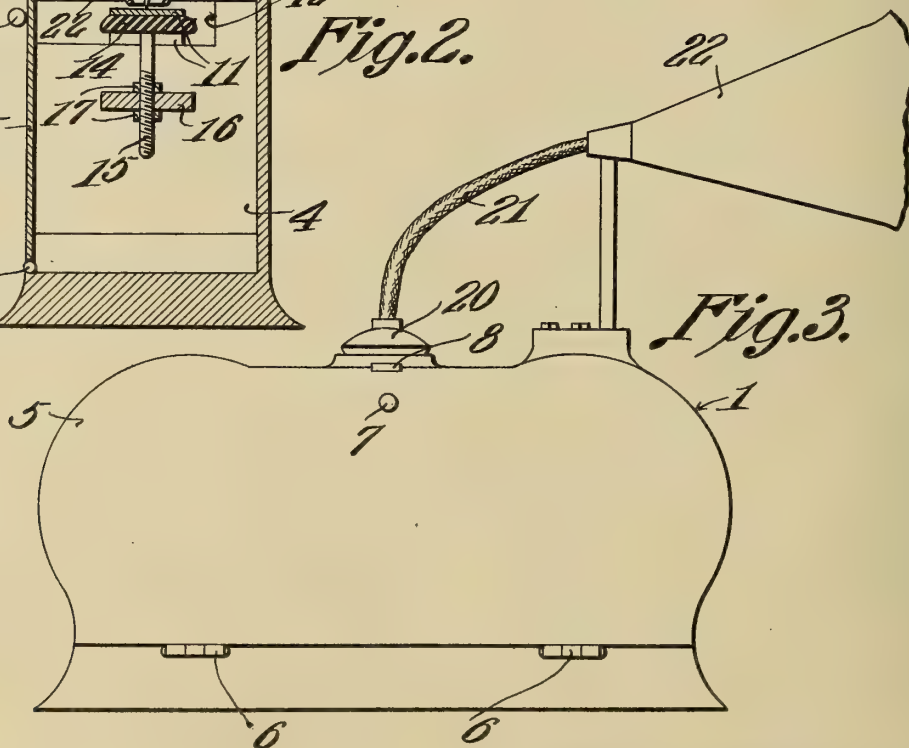
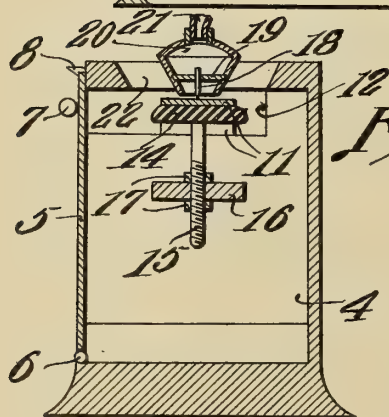
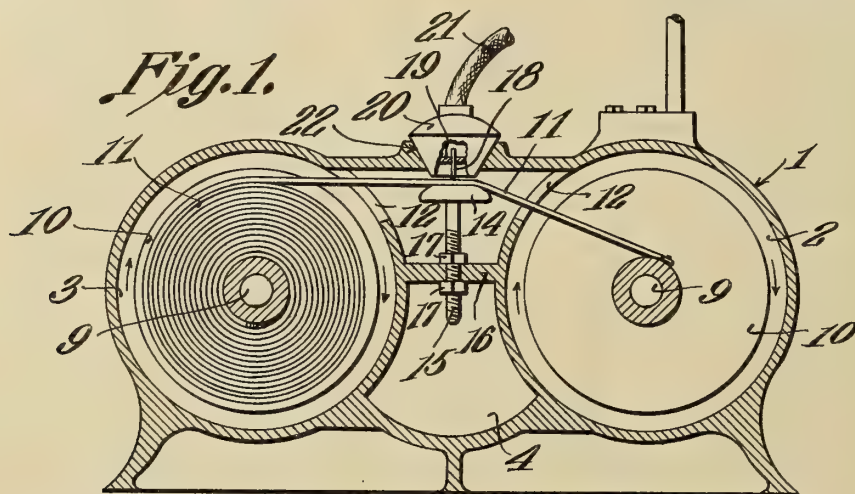
J. B. MEGOWN,

M. C. HAMMON.

R. FORREST.
SOUND RECORDING AND REPRODUCING INSTRUMENT.
APPLICATION FILED DEC. 3, 1910.

1,001,748.

Patented Aug. 29, 1911.



Witnesses

J. H. Forrester
W. H. Clarke

Roland Forrest,
Inventor

by *C. A. Snow & Co.*
Attorneys

UNITED STATES PATENT OFFICE.

ROLLAND FORREST, OF PHILADELPHIA, PENNSYLVANIA.

SOUND RECORDING AND REPRODUCING INSTRUMENT.

1,001,748.

Specification of Letters Patent.

Patented Aug. 29, 1911.

Application filed December 3, 1910. Serial No. 595,531.

To all whom it may concern:

Be it known that I, ROLLAND FORREST, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Sound Recording and Reproducing Instrument, of which the following is a specification.

This invention relates to sound recording and reproducing instruments.

The objects of the invention are to improve and simplify the construction of such devices as well as to increase their efficiency in operation and to reduce the expense attending their manufacture and use.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of invention herein disclosed can be made within the scope of what is claimed without departing from the spirit of the invention.

In the accompanying drawing forming part of this specification, Figure 1 is a vertical section through an apparatus constructed in accordance with the invention. Fig. 2 is a vertical section taken at a right angle to Fig. 1, on a line through the intermediate chamber. Fig. 3 is a side elevation showing the door by means of which the ribbon reels are introduced into and removed from the reel chamber.

Like reference numerals indicate corresponding parts in the different figures of the drawing.

The device of the present invention is constructed preferably with a casing 1 which is divided into a front reel chamber 2, a rear reel chamber 3 and an intermediate chamber 4. As shown in Fig. 2, each of the chambers 2, 3 and 4 is open at one end, and said open end is closed by means of a door 5 which is hinged at its lower end as indicated at 6, and is provided at its upper end with a handle 7, said door being locked in closed position in any suitable manner, such as by means of the spring catch or catches 8. Mounted in each of the reel chambers 2 and 3 is a stud shaft 9 which is adapted to receive a reel 10. A ribbon record, constructed in any suitable manner, and indicated by the numeral 11 extends from the front reel to the rear reel and is adapted

to be wound back and forth first onto one reel and then onto the other reel. The ribbon 11 extends through the intermediate chamber 4 and through cut-away portions 12—12 formed in the circular walls of the front and rear reel chambers 2 and 3. The front and rear reels are adapted to be set in motion in any suitable manner such as by means of clock work or other well known automatic mechanism, not necessary herein to be specifically illustrated and described.

The ribbon 11 on its passage through the intermediate chamber 4 extends over and is guided by a support 14 which is formed preferably of hard rubber and is adjustably supported by means of a standard 15 which extends through a horizontal partition 16 mounted in the intermediate chamber 4 and is provided above and below said partition 16 with lock nuts or other suitable devices 17 by means of which the support 14 may be vertically adjusted. The ribbon 11, above the support 14, is engaged by a needle 18 which may be adapted either for recording or reproducing, said needle being connected with a diaphragm 19 in a sound chamber 20 which communicates through a pipe 21 with the horn 22.

The ribbon 11 is provided in any suitable and well known manner with sound records extending in opposite directions. The needle 18, as shown in Fig. 2, is laterally adjustable, together with the sound chamber 20, in a slot 22 which extends from side to side of the upper end of the intermediate chamber 4. After the record ribbon has been run to one end, the needle 18 is adjusted laterally in the slot 22 and the movement of the ribbon is reversed. The introduction and removal of the reels 10 containing the ribbon 11, and the adjustment of the support 14 are effected by opening the door 5.

The instrument of the present invention is strong, simple, durable and inexpensive in construction as well as efficient in operation.

What is claimed as new is:

A sound recorder and reproducer comprising a casing having front and rear reel chambers, and an intermediate chamber, said reel chambers being circular in cross section and said intermediate chamber being provided with a horizontal partition and having a transverse slot at its upper end formed with beveled side walls, a door closing the ends of said chambers, a pair of reels, one of said reels being mounted in the front

reel chamber, and the other of said reels
being mounted in the rear reel chamber, a
ribbon record extending from one of said
reels to the other, through said intermediate
5 chamber, there being openings in the walls
of said reel chambers to permit the passage
of said ribbon, a standard adjustably mount-
ed in the horizontal partition of said inter-
mediate chamber, a hard rubber support
10 carried by the upper end of said standard,
and a needle provided with downwardly

tapering supporting means adjustable in
said transverse slot at the upper end of said
intermediate chamber.

In testimony that I claim the foregoing as 15
my own, I have hereto affixed my signature
in the presence of two witnesses.

ROLLAND FORREST.

Witnesses:

WALTER FORREST,
JOHN HEALY.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,
Washington, D. C."

J. A. SOLER.
 GRAPHOPHONE ATTACHMENT.
 APPLICATION FILED OCT. 24, 1908.

1,001,780.

Patented Aug. 29, 1911.

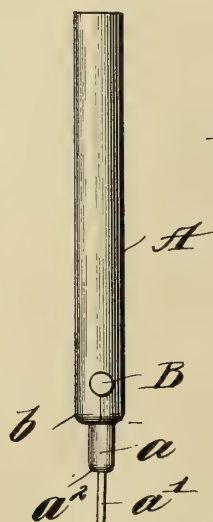


Fig 1.

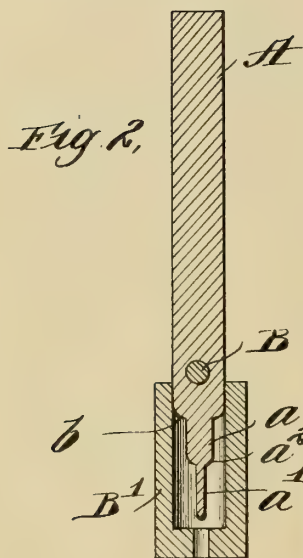


Fig 2.

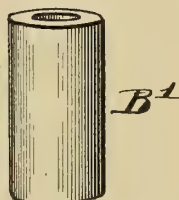


Fig 3.

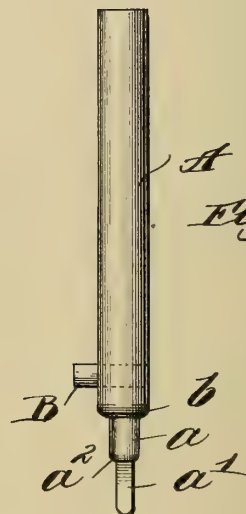


Fig 4.

Witnesses:
 C. A. Paulerschmitt
 J. M. C. C. C.

Inventor:
 Joseph A. Soler
 By J. M. C. C. C.
 Atty

UNITED STATES PATENT OFFICE.

JOSEPH A. SOLER, OF CHICAGO, ILLINOIS.

GRAPHOPHONE ATTACHMENT.

1,001,780.

Specification of Letters Patent. Patented Aug. 29, 1911.

Application filed October 24, 1908. Serial No. 459,308.

To all whom it may concern:

Be it known that I, JOSEPH A. SOLER, a citizen of the United States, residing at Chicago, Illinois, have invented certain new and useful Improvements in Graphophone Attachments, of which the following, taken in connection with the drawing, is a description.

My invention has for its object the production of a needle designed to be used in graphophones to reproduce the sound from the record.

Heretofore it has been customary to use a needle so constructed that one or two operations thereof dulls the point and it has to be replaced by a new one very frequently, and which, by the frictional contact with the disk over which the needle is moving, wears out the disk in a comparatively short time. This necessitates constantly replenishing the needles and buying new records. By my improved needle these objections are overcome by the use of a needle having a point made of tempered steel, or a jewel and with care can be used on fifty or more records. By tempering the steel and shaping the shank of the needle as shown, it is operated on a record with less friction, thereby greatly prolonging the life of the record, at the same time eliminating the grating and scratching occasioned by the use of the ordinary needle and reproducing the voice or music from the record with a much smoother and sweeter tone than is now possible, with the old style needles.

In the accompanying drawings forming part of this specification, and in which like letters of reference indicate corresponding parts, I have illustrated the essential features of my invention, although the same may be carried into effect in other ways without in the least departing from the spirit thereof.

In the drawings in which all of the figures are greatly magnified, Figure 1 is a front elevation of my invention showing the position of the needle in the record; Fig. 2 is a sectional view of the needle with the cap secured thereon; Fig. 3 is a side elevation of the cap; and Fig. 4 is an enlarged side elevation of the needle.

In carrying out my invention A represents the needle shank which may be of a size suitable to fit into the socket of any

machine now on the market. At the lower end of the shank the diameter thereof is made smaller as at *a*, and is then shaped into the needle point *a'*. The needle point *a'* is rectangular in cross section, the front edge thereof being shown in Figs. 1 and 2 and a side view in Fig. 4.

At a suitable place above the narrow edge of the needle point is an indicator or guide B which may be a small projection on the shank or may be a pin secured in an aperture in the shank, the purpose of this indicator being to insure the proper position of the needle when inserted into the socket of the machine. In the construction of the needles the point *a'* is hardened by a tempering process which renders it practically a diamond point and by elongating the point as shown in the drawing the rectangular portion thereof *a'* may be used upon a record until it is worn to the shoulder *a''*, which will require from fifty to seventy five records of the ordinary size.

To protect the point of the needle when not in use I provide a cap B' which is cylindrical in shape, the bore thereof being closed at one end. This cap fits over the needle point and is held by frictional contact into engagement with the shank at the largest diameter thereof just above the shoulder *b*. By placing the cap upon the needle when it is not in use prevents any scratching of the record by accidental displacement and also protects the point of the needle.

The advantages of my invention will be apparent to those skilled in the art.

My improvements are very simple in construction, comprising few parts, can be easily and cheaply manufactured and placed in position, and are effectual in all respects in the performance of their functions.

Slight changes may be made in the details of construction, and in the size, shape and proportions of the parts without departing from the spirit of my invention or limiting its scope, and I therefore do not wish to be limited to the details as here shown, but contemplate such changes in the shape and proportions of the shank as found desirable in order to fit different makes of machines.

I claim:

A needle of the class described comprising a shank having an elongated point of

tempered steel, shoulders b and a^2 surrounding said shank, said shank having an opening therethrough extending in the line the needle is to travel, and an adjustable indicator positioned in said opening, substantially as described.

In testimony whereof I have signed this

specification in the presence of the two subscribing witnesses.

JOSEPH A. SOLER.

Witnesses:

JAMES P. CRANE,
CHARLES I. COBB.

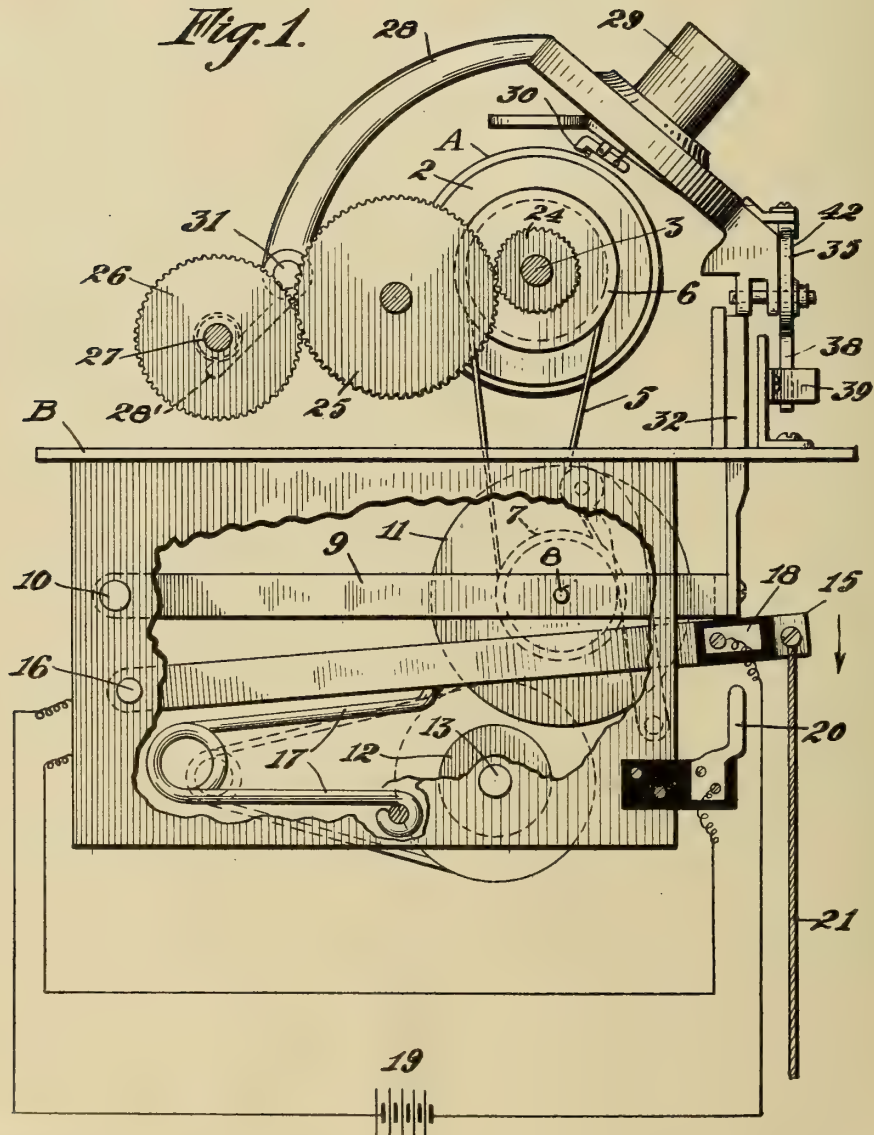
Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

J. H. ERICKSON.
 PHONOGRAPHIC AUTOMOBILE ALARM.
 APPLICATION FILED OCT. 24, 1910.

1,001,830.

Patented Aug. 29, 1911.

3 SHEETS—SHEET 1.



WITNESSES;

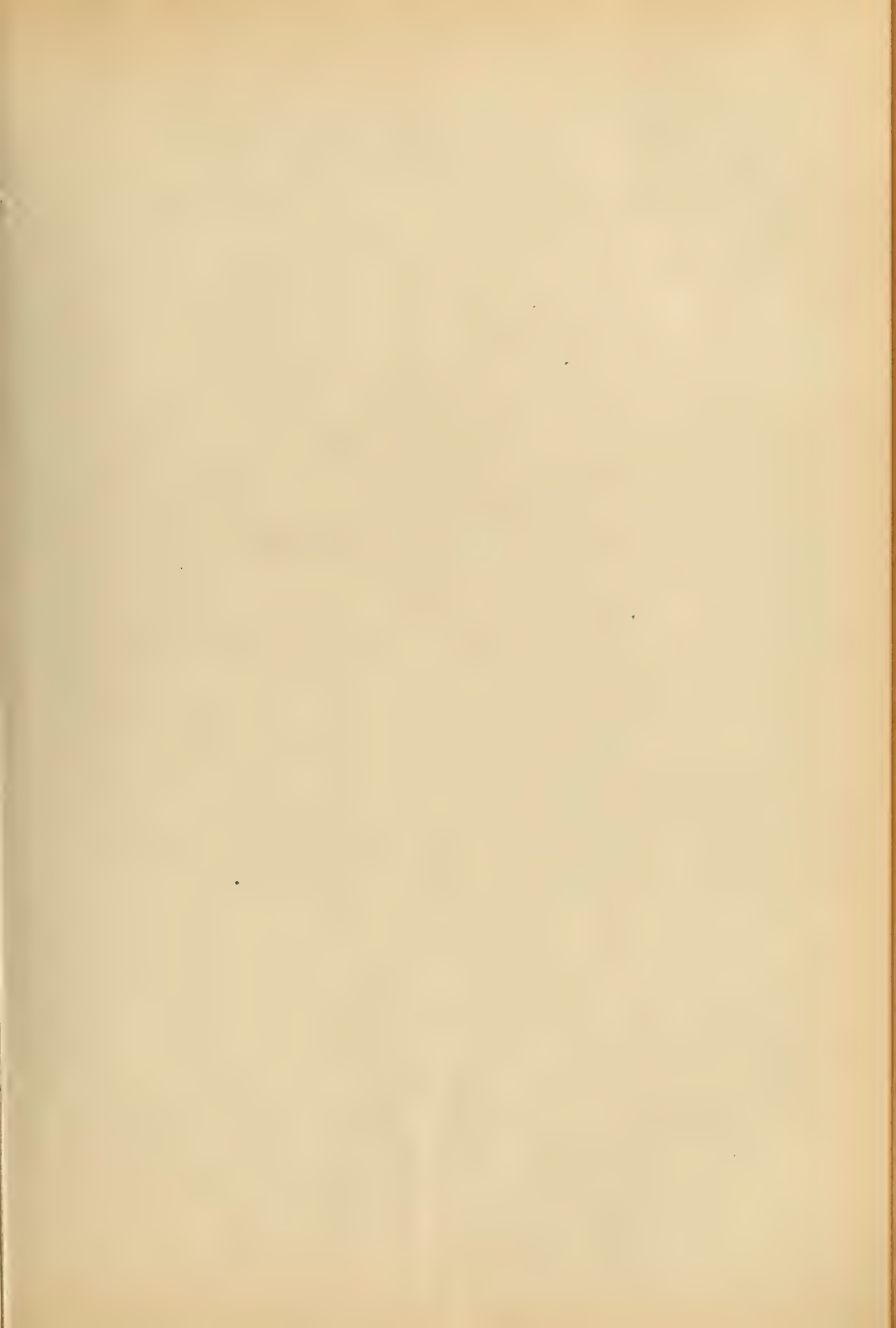
R. S. Berry
Charles Pickles

INVENTOR

JOSEPH H. ERICKSON

BY *Geo. H. Strong*

HIS ATTORNEY.



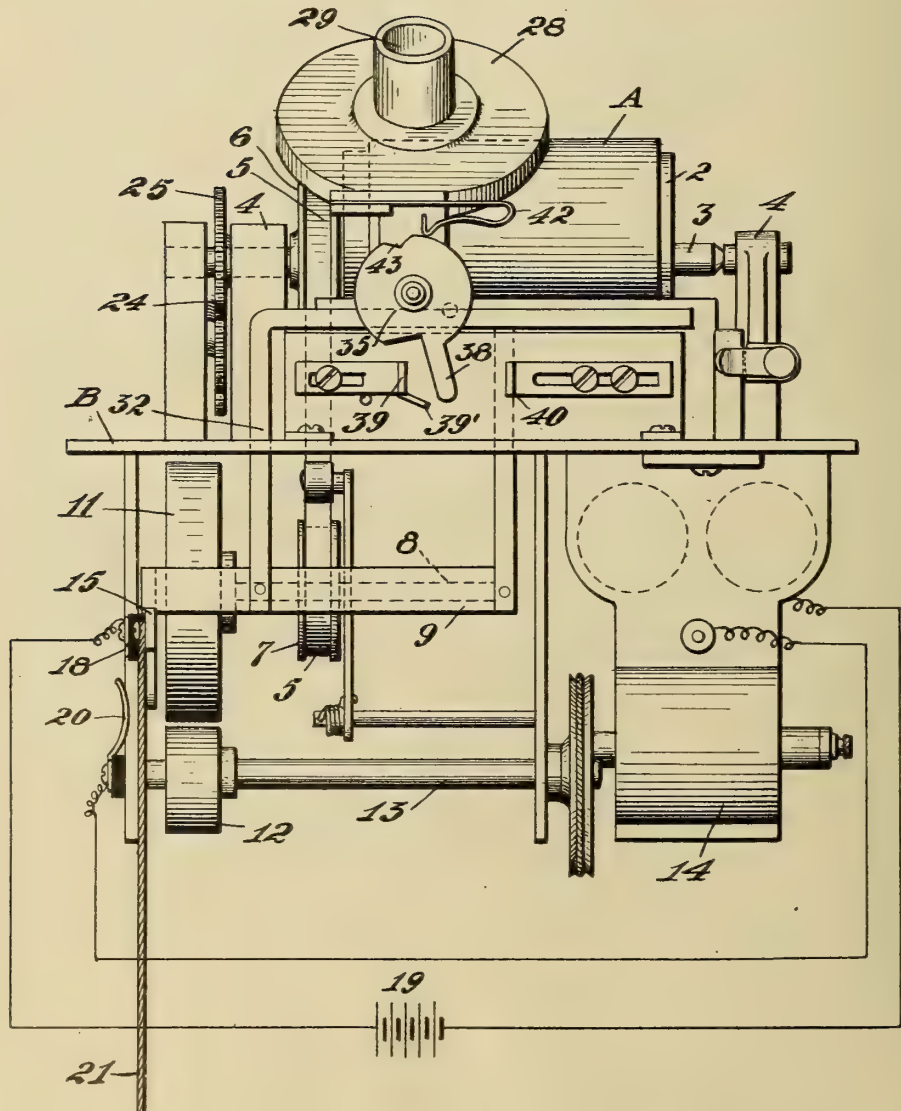
J. H. ERICKSON.
 PHONOGRAPHIC AUTOMOBILE ALARM.
 APPLICATION FILED OCT. 24, 1910.

1,001,830.

Patented Aug. 29, 1911.

3 SHEETS—SHEET 2.

Fig. 2.



WITNESSES

Chas. S. Berry
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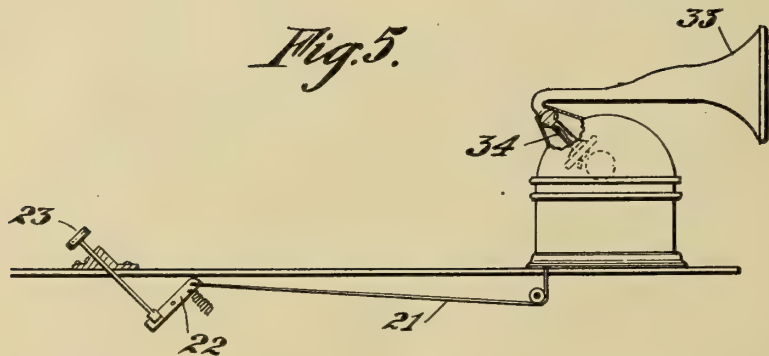
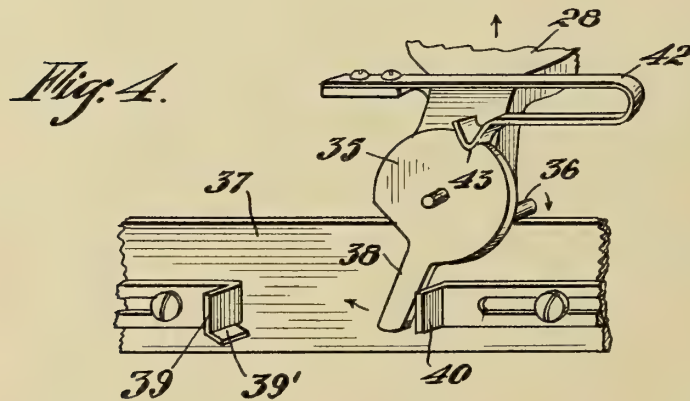
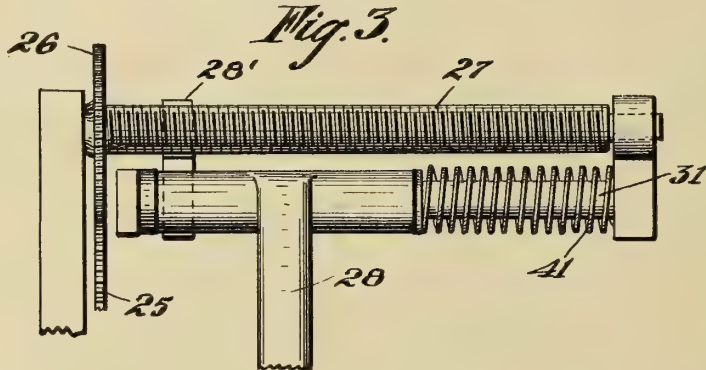


J. H. ERICKSON.
 PHONOGRAPHIC AUTOMOBILE ALARM.
 APPLICATION FILED OCT. 24, 1910.

1,001,830.

Patented Aug. 29, 1911.

3 SHEETS—SHEET 3.



WITNESSES

A. S. Bump
Charles Pickles

INVENTOR

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HIS ATTORNEY.

UNITED STATES PATENT OFFICE.

JOSEPH H. ERICKSON, OF SAN FRANCISCO, CALIFORNIA.

PHONOGRAPHIC AUTOMOBILE-ALARM.

1,001,830.

Specification of Letters Patent. Patented Aug. 29, 1911.

Application filed October 24, 1910. Serial No. 588,643.

To all whom it may concern:

Be it known that I, JOSEPH H. ERICKSON, a citizen of the United States, residing in the city and county of San Francisco and State of California, have invented new and useful Improvements in Phonographic Automobile-Alarms, of which the following is a specification.

This invention relates to a phonographic automobile alarm, and particularly pertains to an automatic repeating attachment for phonographs and the like.

It is the object of this invention to provide an automobile alarm which is operated by a phonograph so as to produce spoken or musical warnings, and to provide automatic means by which the warnings may be controlled and given repeatedly, if desired.

A further object is to provide mechanical means by which quick action of the phonograph will be effected, both at the beginning and at the termination of the alarm, thus insuring the warning being quickly and sharply given and instantly cut off at its completion.

The invention consists of the parts and combination and construction of parts as hereinafter more fully described and claimed, having reference to the accompanying drawings, in which—

Figure 1 is a side view of the invention with parts broken away. Fig. 2 is a front view of the same. Fig. 3 is a plan view of the carriage actuating mechanism. Fig. 4 is a perspective view of the carriage tripping device. Fig. 5 is a view showing the invention as applied.

In the drawings A represents the ordinary cylindrical phonograph record which is mounted to revolve with a drum 2 secured to a shaft 3 supported at each end in suitable bearings 4, mounted on a base plate B, as is common in phonograph construction. The shaft 3 is rotated by means of a belt 5 which passes around a wheel 6 on the shaft 3 and a wheel 7 on a shaft 8 located beneath the plate B and parallel with the shaft 3. The shaft 8 is supported at both ends on a rockable frame 9, pivoted at 10, some distance to the rear of the shaft 8, and is adapted to be rotated by means of a friction drive composed of a friction pulley 11 mounted on the shaft 8 and a similar pulley 12, on a shaft 13. The pulley 11 is adapted to be thrown in and out of contact with the pulley 12 by rocking the frame 9, as later described. The shaft 13 is rotated through a belt drive by

means of a small electric motor 14 disposed beneath the plate B; the motor 14 being thrown in and out of operation synchronously with the engaging and disengaging of the friction pulley 11 with the pulley 12. This is accomplished by the following mechanism:—An arm 15 extending beneath the frame 9 and pivoted at 16 contacts the underside of the outer end of the frame and sustains it in its normally uppermost position with the pulley 11 out of contact with the pulley 12; the arm 15 being caused to continually press upward to lift the frame by means of a spring 17, which bears against the underside of the arm 15, as shown in Fig. 1. The outer end of the arm 15 projects beyond the end of the frame 9 and is provided with a contact plate 18 which connects with one pole of a battery 19, the other pole of which connects with one terminal of the motor 14. A knife 20 is disposed beneath the arm 15 in line with the contact plate 18 so as to be thrown into contact with the latter as the outer end of the arm 15 is pulled downward, as later described; the knife 20 being electrically connected with the other terminal of the motor 14. A cord 21 is attached to the outer end of the lever 15 and is intended to be connected to any suitable device or means for exerting a sufficient pull thereon in opposition to the spring 17 to throw the contact plate 18 into contact with the knife 20, and thus complete a circuit from the battery 19 to actuate the motor 14 and at the same time permit the frame 9 to drop downward and cause the pulley 11 to be engaged by the pulley 12 to rotate the drum 2 and record A.

In Fig. 5 the cord 21 is shown as connected to a lever 22 which is adapted to be actuated by means of a push button or tread 23, which may be disposed at any convenient point remote from the mechanism just described.

The shaft 3 carries a pinion 24 on one end which engages with an idle gear 25 which in turn meshes with a gear 26 on a threaded shaft 27, so as to rotate the latter when the shaft 3 is revolved as before described.

A carriage 28 carrying the usual sound box 29 and needle 30 of a phonograph is slidably mounted on a shaft 31 extending parallel with and a little above the threaded shaft 27, an extension 28' on the carriage 28 projecting beneath the shaft 27 and threaded at its point of contact therewith, so that

when engaged by the threaded shaft 27 the carriage 28 will be caused to move in one direction across the record A. as is well known in phonographs of this type. Normally the
 5 needle 30 is held out of contact with the record cylinder A. and the carriage 28 out of engagement with the threaded shaft 27, by means of a standard 32 mounted on the frame 9, the upper end of which is turned to
 10 extend parallel with the record A and to form a support upon which a projection on the outer end of the frame 28 is adapted to rest. From this it will be seen that when the frame 9 is allowed to drop downward by
 15 a pull on the cord 21, the needle 30 will be thrown into contact with the record A. so as to vibrate the diaphragm in the sound box 29 and reproduce the sounds originally recorded on the cylinder A; the carriage 28
 20 carrying the needle 30 and sound box 29 being moved along by the threaded shaft 27, which normally engages the carriage when the needle 30 contacts the record A.

By attaching the mouthpiece of the sound
 25 box 29 to an automobile horn 33 by a flexible tube 34, as shown in Fig. 5, and mounting the whole device upon an automobile an effective alarm or warning is obtained, which may be operated at will by pressing upon the
 30 button 23. The exact expression of warning to be given may be anything suitable which may be produced by phonographic record, such as for instance, "Get out of the way," a bugle call or the like.

35 As it may be desired to give continuous alarms and constantly repeat the warnings, means are provided for automatically returning the carriage 18 instantly to its normal position as soon as it has passed the
 40 length of the record A, so as to repeat the alarm as long as the arm 15 and frame 9 are pulled down. This is accomplished by mounting a disk 35 on the front end of the carriage 28 in front of the standard 32, a
 45 pin 36 on the back of the disk projecting above a vertically disposed plate 37 on the base plate B; and having a finger 38 extending downward between two adjustable stops
 50 39—40, as shown in Figs. 2 and 4. When the outer end of the carriage 28 is in its lowermost position with the needle 30 in contact with the record A and the projection
 55 28' engaged by the threaded shaft 27, the pin 36 will contact the plate 37 so that when the finger 38 comes in contact with the stop
 60 40 as the carriage 28 moves forward, the disk 35 will be rocked on its bearing with the pin 36 acting as a cam on the plate 37 to raise the outer end of the carriage 28 and
 65 release the threaded projection 28' from the shaft 27 whereupon a spring 41 on the shaft 31 will return the carriage 28 to its starting position. A spring 42 engages a notch 43 on the disk 35 to retain it in the position set
 by the stop 40 until the carriage 28 has com-

pleted its return, whereupon a lip 39' on the stop 39 is encountered by the finger 38 which acts to restore the disk 35 to its normal position and allows the front end of the carriage 28 to drop down as before, to be again carried
 70 across the record A.

The operation of the invention is apparent from the foregoing description; it being readily seen that when it is desired to give a phonographic alarm, a pull on the string 21
 75 will allow the carriage 28 to gravitate downward to throw the needle 30 into operative engagement with the record A, and at the same time start the motor 14 which revolves the record A and moves the carriage 28 forward as before described, and that as long as
 80 the arm 15 is down by virtue of the pull on the string 21 the motor 14 will continue to act and the carriage will repeatedly travel back and forth across the record by means
 85 of threaded shaft 27, the trip disk 35 and its co-acting parts and the spring 41; and that as soon as the pull on the string 21 is released the carriage 28 will be lifted up by the standard 32 and returned to its normal
 90 position by the spring 41.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. A phonographic automobile alarm
 95 comprising a revoluble record, a sound box and stylus and amplifying horn, controllable means to mechanically engage and disengage the stylus and record, said means
 100 comprising a movable support for normally maintaining the stylus out of engagement with the record, a spring pressed member engaging the said support and holding it in an elevated position, and
 105 means for moving said member to allow the stylus to engage the record, a driving element, and a transmitting mechanism between said element and the record, and movable into engagement with the driving element
 110 substantially simultaneously with the engagement of the stylus with the record.

2. A phonographic automobile alarm
 115 comprising a revoluble record, a sound box and stylus and amplifying horn, controllable means to mechanically engage and disengage the stylus and record, said means
 120 comprising a movable support for normally maintaining the stylus out of engagement with the record, a spring pressed member engaging the said support and holding it in an elevated position, and means for moving
 125 said member to allow the stylus to engage the record, a driving element, and a transmitting mechanism between said element and the record, and movable into engagement with the driving element substantially
 130 simultaneously with the engagement of the stylus with the record, and means to automatically return the record and repeat the signal.

3. A phonographic automobile alarm, consisting of a revoluble record, a sound box and stylus, and amplifying horn, a motor, a pivoted frame for normally holding the stylus out of engagement with the record, a spring pressed arm engaging the frame and normally holding the same in an elevated position, a motor, means for retracting the arm to allow the frame to drop so that the stylus may engage the record, electrical connections for energizing the motor substantially simultaneously with the engagement of the stylus with the record, and driving connections between the motor and the record, one of said connections being carried by said arm.

4. In apparatus of the character described, the combination with a revoluble record, a sound box and stylus, and an amplifying horn, of means for holding the stylus normally out of engagement with the record, a motor, means interposed between the stylus and the motor for normally supporting the first named means, connections between the motor and the second named means by which the motor is started substantially simultaneously with the release of the stylus supporting means and the engagement of the stylus with the record, and driving connections between the motor and the record, one of said connections being carried by the stylus supporting means.

5. The combination with a phonographic record, sound box, stylus and amplifying horn of a motor and a friction drum driven by said motor, a companion drum, a hinged lever upon which said drum is journaled, pulley and belt connections between said drum and the revoluble record, means by which the record friction drum is normally held out of contact with its driver, and means by which the drums are brought into contact and the motor energized in unison.

6. The combination of a phonographic record, sound box, stylus and amplifying horn, of a motor, a frictional drum driven thereby, a second drum, a hinged lever upon which said second drum is journaled, belt and pulley connections between said second drum and the record, a spring actuated lever whereby the first named lever and its frictional drum are normally maintained out of contact with the motor driven drum, a switch located in the motor circuit, said switch having a fixed member and a member movable with the spring lever, and connections whereby said lever may be depressed to close the switch and energize the motor and to allow the frictional drum to drop into contact so as to impel the revoluble record.

7. In a phonograph having a revoluble phonographic record, a stylus and a reciprocal stylus carrying carriage adapted to gravitate into operative contact with the record, a spring actuated support for normally holding the stylus out of contact with the record, means for depressing the spring, yieldable means for normally retaining the stylus in the starting position while the latter is out of contact with the record, automatic means for lifting the stylus out of contact with the record to allow said yieldable means to instantly return the carriage and stylus to the starting position while the aforesaid yieldable means is compressed to cause a repetition of the travel of the stylus along the record, said last named means comprising a disk pivoted to the carriage, a pin on the disk eccentric to the pivotal point thereof, and means for rocking said disk to cause said pin to bear against said support to lift the carriage.

8. The combination in a phonograph having a revoluble record, a carriage reciprocal above the record and a stylus on the carriage adapted to contact the record, a spring for holding the carriage and stylus free from the record, means for depressing said spring from a distance to allow the stylus to engage the record, means for rotating the record, threaded means for moving the stylus carriage in one direction across the record while the stylus is in contact therewith, yieldable means for instantly returning the stylus carriage the moment the stylus is lifted from the record, and means for automatically lifting the stylus from the record at a predetermined point in the forward movement of the carriage, said last named means consisting of a trip member pivoted on the carriage, a fixed support, a pin on the trip member adapted to be caused to bear against the fixed support to lift the trip member and the carriage therewith, an adjustable stop to actuate the trip member on its forward movement to cause it to lift and support the carriage, a detent for holding the trip member fixed while the carriage moves back and an adjustable stop for again actuating the trip at the end of the return movement to release the detent and allow the stylus to again drop back upon the record to repeat the forward movement.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOSEPH H. ERICKSON.

Witnesses:

JOHN H. HERRING,

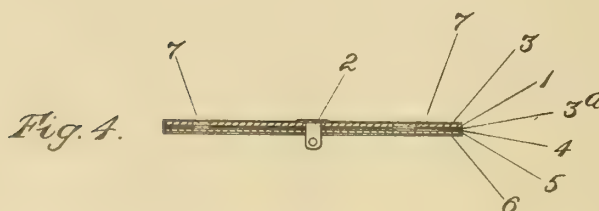
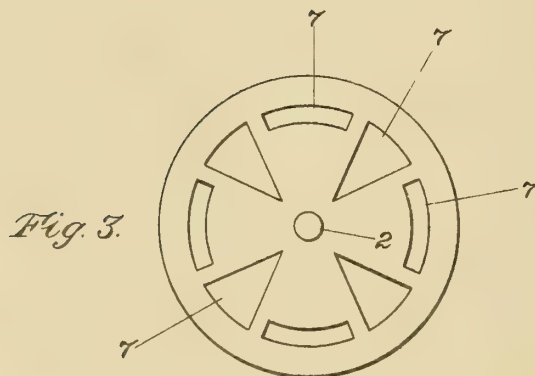
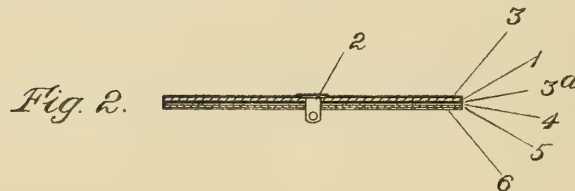
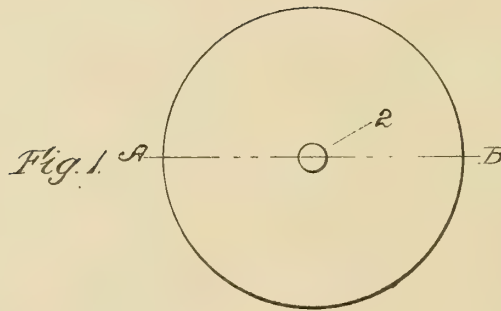
WM. C. UNDERHILL.

11

J. H. MASSEY.
ACOUSTIC DIAPHRAGM.
APPLICATION FILED MAY 22, 1911.

1,001,968.

Patented Aug. 29, 1911.



Witnesses:
Oscar F. Hill
Edith A. Freeman

Inventor:
John H. Massey
by *Chas. F. Randall*
Attorney.

UNITED STATES PATENT OFFICE.

JOHN H. MASSEY, OF PROVIDENCE, RHODE ISLAND.

ACOUSTIC DIAPHRAGM.

1,001,968.

Specification of Letters Patent.

Patented Aug. 29, 1911.

Application filed May 22, 1911. Serial No. 628,611.

To all whom it may concern:

Be it known that I, JOHN H. MASSEY, a citizen of the United States, residing at Providence, in the county of Providence, State of Rhode Island, have invented a certain new and useful Improvement in Acoustic Diaphragms, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention has relation to acoustic diaphragms such as are employed in talking machines and the like.

It consists in a diaphragm of improved construction and character, the features of which I will first explain with reference to the illustrated embodiments of the invention, and then particularly point out in the claim at the close of this specification.

In the drawings.—Figure 1 shows in plan a diaphragm embodying the invention, and Fig. 2 is a view thereof in cross section in the plane of the line A-B of Fig. 1. Figs. 3 and 4 are views similar to Figs. 1 and 2, showing another embodiment of the invention.

In the construction of my diaphragm I employ a disk 1 of paper material, which latter I prefer to metal, as being more durable than the latter, not subject to oxidation, and giving better tone results. I have shown combined with the said disk a so-called cross-head 2 for service when the diaphragm is used in a machine requiring a diaphragm to have such cross-head. Diaphragms for use in machines not requiring cross-heads in connection with the diaphragms will be made without cross heads.

To the surfaces of the disk 1 I apply coatings 3, 3^a, of bronze powder in lacquer. Thereby a firm, smooth, and waterproof sur-

facing is provided, and the durability of the article increased, and better tone results are secured.

To the bronze coating 3^a at the inner side of the paper disk 1 I apply a coating 4 of shellac, and before such coating dries I apply thereto a layer 5 of tissue paper. The shellac gives a harder surface, and the tissue paper serves to reinforce and help the tone. To the exposed face of the tissue paper layer 5 I apply a final layer or coating 6 of shellac. This gives a hard firm waterproof finish to the inner surface of the complete article.

In some cases the diaphragm may have made therein holes or perforations 7, 7, Figs. 3 and 4, of varying shapes and proportions in the paper disk 1, which are bridged by the tissue paper 5, although usually the said disk will be unperforated as in Figs. 1 and 2.

Practical experience with my improved diaphragm shows that it yields a much greater volume of tone with clearer articulation than in the case of many of the diaphragms heretofore in use.

What is claimed as the invention is:

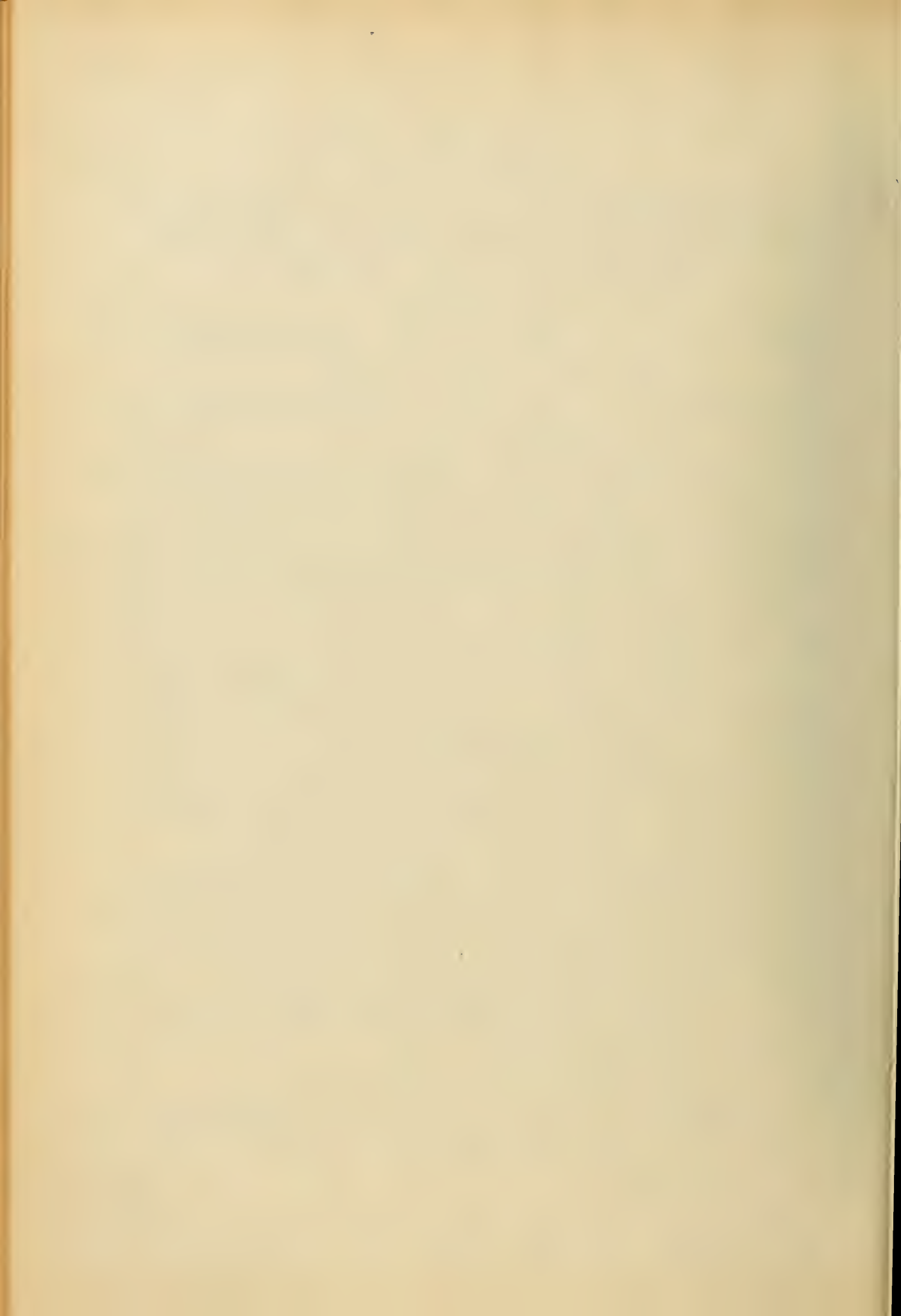
An acoustic diaphragm consisting of a disk of paper material, bronze coatings upon the two faces of such disk, a coating of shellac upon one of such bronze coatings, a layer of tissue paper upon such coating of shellac, and a coating of shellac upon the exposed face of the tissue paper.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN H. MASSEY.

Witnesses:

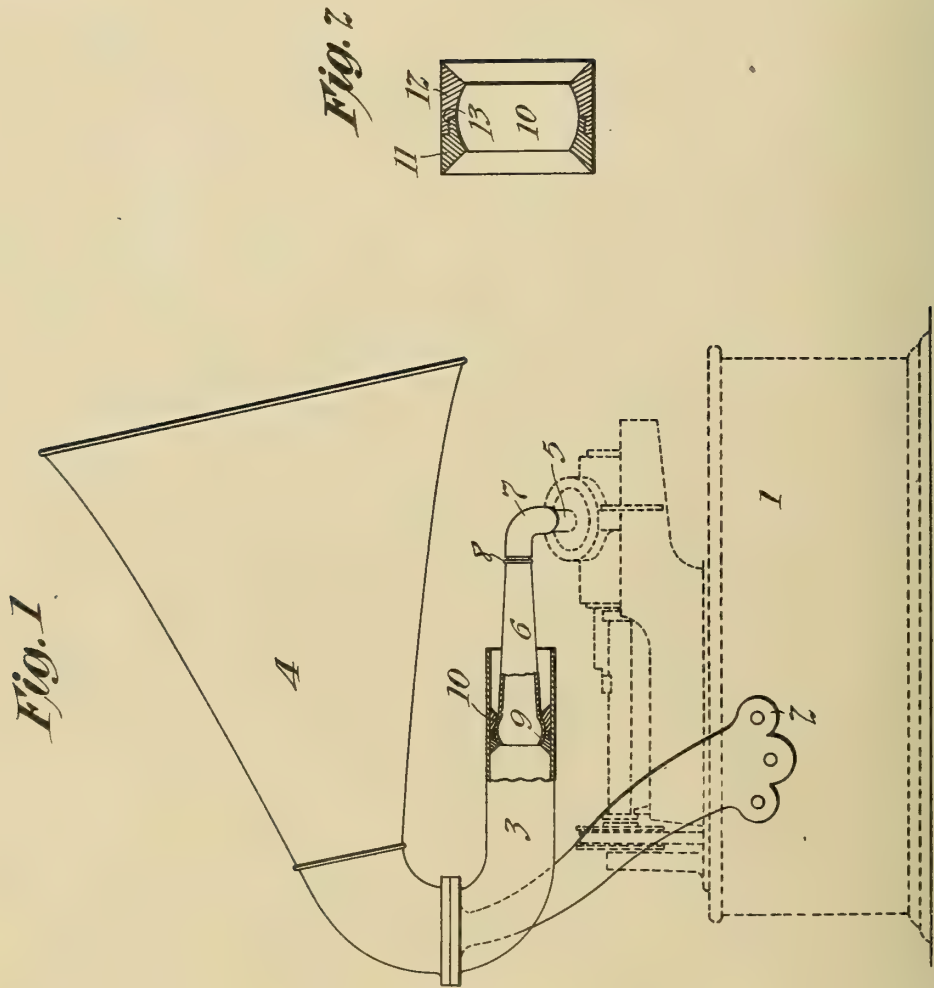
CHAS. F. RANDALL,
NATHAN B. DAY.



W. H. MILLER.
 PHONOGRAPH.
 APPLICATION FILED JAN. 18, 1909.

1,002,074.

Patented Aug. 29, 1911.



Witnesses:
 Frank D. Lewis
 Dyer Smith

Inventor:
 Walter H. Miller
 by Frank L. Dyer
 Atty.

UNITED STATES PATENT OFFICE

WALTER H. MILLER, OF ORANGE, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

PHONOGRAPH.

1,002,074.

Specification of Letters Patent.

Patented Aug. 29, 1911.

Application filed January 18, 1909. Serial No. 473,001.

To all whom it may concern:

Be it known that I, WALTER H. MILLER, a citizen of the United States, and a resident of Orange, county of Essex, and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, of which the following is a description.

My invention relates to phonographs, and particularly to phonograph horns and means for supporting the same.

In my application Serial No. 430,259, filed May 1, 1908, I disclose a structure in which the horn is provided with a straight section arranged parallel to the path of the traveling carriage of the phonograph as the latter traverses the record in reproducing the same. A tapered tube member connected to the reproducer neck is arranged, in the above described application, to slide back and forth in the fixed tube above referred to with the movement of the traveling carriage, whereby bending and twisting stresses upon the telescoping parts are avoided.

This application is an improvement on the above construction, which consists chiefly in the provision of a member slidably engaged within the rigid tube member, and fitting snugly therein, in which member the end of the tube section, which is attached to the reproducer neck, has a universal joint. By this means an improved joint is provided between the telescoping parts whereby loss of air is prevented, while at the same time, the advantages accruing from the elimination of stresses are retained.

In order that the invention may be fully understood, reference is hereby made to the accompanying drawings, which form a part of this specification, wherein—

Figure 1 represents my improved horn and connections applied to a phonograph, which latter is shown in dotted lines, and Fig. 2 is a detail sectional view of the bearing member in the rigid tube enlarged to show the method of connecting together the parts of the same.

In the drawings, the numeral 1 indicates the phonograph to which my improvement is applied. I have found it convenient to connect my rigid tube, which is arranged parallel to the path traversed by the phonograph reproducer to the phonograph by means of a bracket secured to the rear of the phonograph and extending upwardly and

forwardly, and toward the end of the instrument in such a manner that the rigid tube may be connected by an upward bend to the lower face of the said bracket substantially on the central longitudinal line of the instrument and at the end thereof opposite the end gate or the end of the phonograph mandrel upon which the record is inserted. The bell-shaped mouth piece of the horn is connected to the upper face of the bracket and is preferably so mounted that it may be made to rotate in a horizontal plane as is common.

The bracket above described is represented by the reference numeral 2. The rigid tube, which is parallel to the path of the reproducer is indicated by the numeral 3, and the bell shaped portion of the horn, which is connected to the upper side of the bracket as above described, is represented by the reference numeral 4. It is to be understood that while I prefer to provide the common supporting means for the mouth piece 4 and the rigid tube 3 in the neighborhood of one end of the instrument and at a short distance thereabove, this device may be supported from the phonograph cabinet by any convenient form of support as well as that which I have described and shown. The member for connecting the neck of the reproducer 5 to the cylindrical tube 3 is designated by the reference numeral 6. This hollow member is preferably tapering in form and its smaller end is preferably removably connected to the reproducer neck 5 by means of the elbow 7. An outwardly projecting bead 8 is preferably formed upon the member 6 and serves to determine the position of the elbow 7 thereon. The larger end of the member 6 is flared outwardly as indicated at 9 into a partial spherical shape. This fits snugly within the shoe or sliding member 10 which slidably engages within the rigid tube 3, a ball and socket or universal joint being thereby provided between the member 6 and the shoe 10, allowing the easy removal of the elbow 7 from the reproducer neck 5.

In the construction indicated, the shoe 10 is formed of two members 11 and 12 in order that the same may be easily fitted to the spherical end 9 of the tube 6, although any other convenient method of forming this joint may be used. As indicated, the mem-

bers 11 and 12 may be placed on the outside of the spherical end 9 of the tube 6 and may conveniently be secured together as by screw thread engagement of a flange on the sections 11 and 12, as indicated at 13 in Fig. 2. The end 9 of the tube 6 with the shoe 10 carried thereby may then be inserted within the end of the rigid tube 3 in which it is then adapted to slide in the course of the forward and backward travel of the phonograph carriage.

In operation, the slidable member 6 is carried with the reproducer and telescopes within the tube 3 with entire absence of the stress or strain which has always been found so objectionable in all cases where a joint has been inserted between a movable member such as the traveling carriage of the phonograph, and a stationary member, such as the horn. When a record has been played and it is desired to move the reproducer back to its original position, the reproducer is raised in the usual fashion so as to disengage the feed nut from the screw and is pushed back to its original position.

It will be noted that with the device shown, a horn of any convenient size may be used, since, when the horn is turned so as to be directed endwise of the phonograph, as shown, the entire length of the phonograph cabinet serves as a supporting piece for the horn, rendering it practically impossible to overturn the cabinet by the use of a horn of any reasonable size. The horn, however, may be turned in any desired direction as is evident.

Having now described my invention, what I claim and desire to secure by Letters Patent of the United States is as follows:

1. In a phonograph, the combination with a horn section and means for supporting the same, of a movable reproducer, and telescoping connections between the horn section and the reproducer, comprising a tube fixed with its longitudinal axis parallel to the path traversed by the reproducer in its

movement, an annular shoe slidably mounted in said tube, and a hollow tapering member pivotally connected with said shoe and communicating with the reproducer, substantially as described.

2. In a phonograph, the combination with a horn section and means for supporting the same, of a movable reproducer, and telescoping connections between the horn section and the reproducer, comprising a tube fixed with its longitudinal axis parallel to the path traversed by the reproducer in its movement, a shoe slidably mounted in said tube, and a tube communicating with the reproducer and having a ball and socket connection with said shoe, substantially as described.

3. In a phonograph, the combination with a horn section and means for supporting the same, of a movable reproducer, and telescoping connections between the horn section and the reproducer, comprising a tube fixed with its longitudinal axis parallel to the path traversed by the reproducer in its movement, annular members slidably mounted in said tube, and a tube communicating with the reproducer and having an enlarged rounded end embraced by said annular members to constitute a ball and socket joint, substantially as described.

4. In a phonograph, the combination with a horn section and means for supporting the same, of a movable reproducer, and telescoping connections between the horn section and the reproducer, comprising a fixed tube, a member slidably mounted in said tube, and a tube communicating with the reproducer and having a ball and socket connection with said member, substantially as described.

This specification signed and witnessed this 16 day of January 1909.

WALTER H. MILLER.

Witnesses:

DYER SMITH,
ANNA R. KLEHM.

M. G. GRAHAM, DEC'D.
M. A. GRAHAM, ADMINISTRATRIX.
PHONOGRAPH HORN.
APPLICATION FILED NOV. 24, 1908.

1,002,205.

Patented Aug. 29, 1911.

2 SHEETS—SHEET 1.

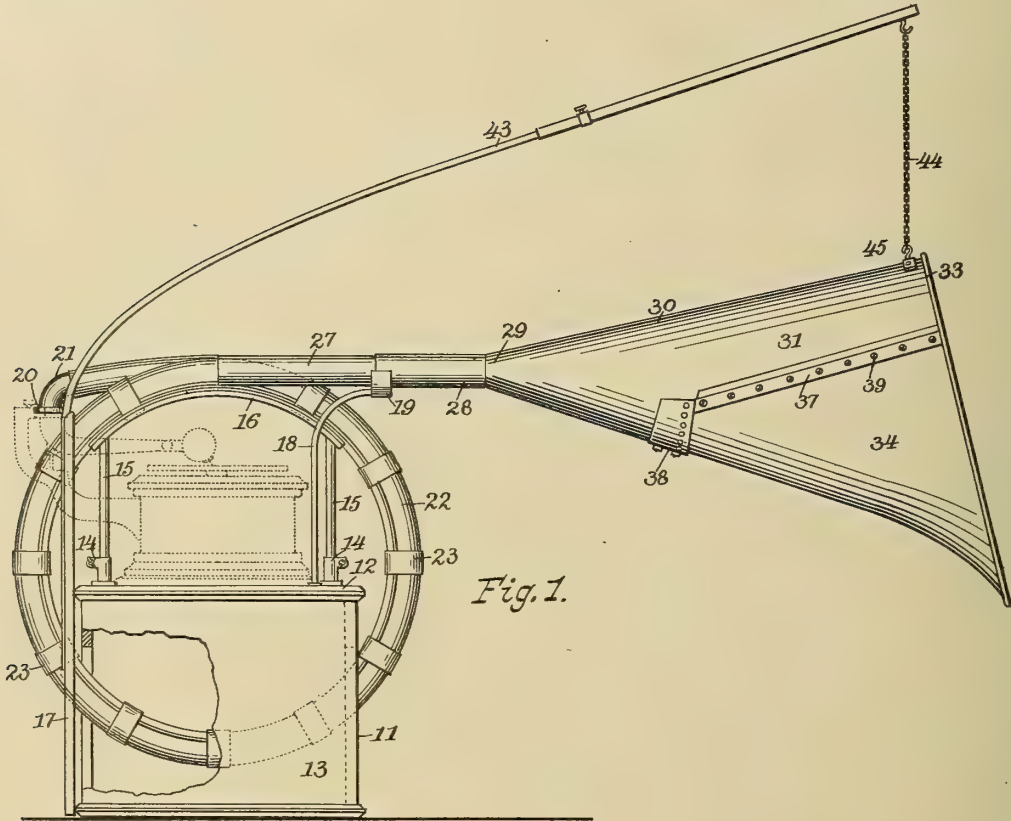


Fig. 1.

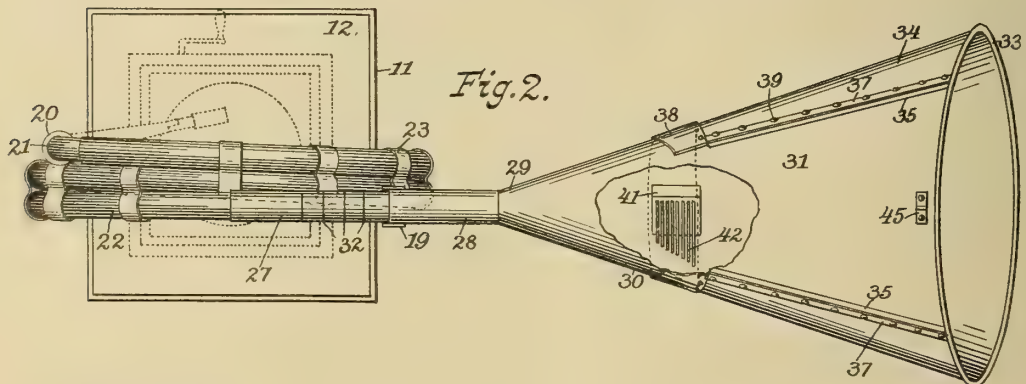


Fig. 2.

Witnesses,
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John W. Kelso

Miles G. Graham,
Inventor,
by *Geo. L. Cooper*
Attorney

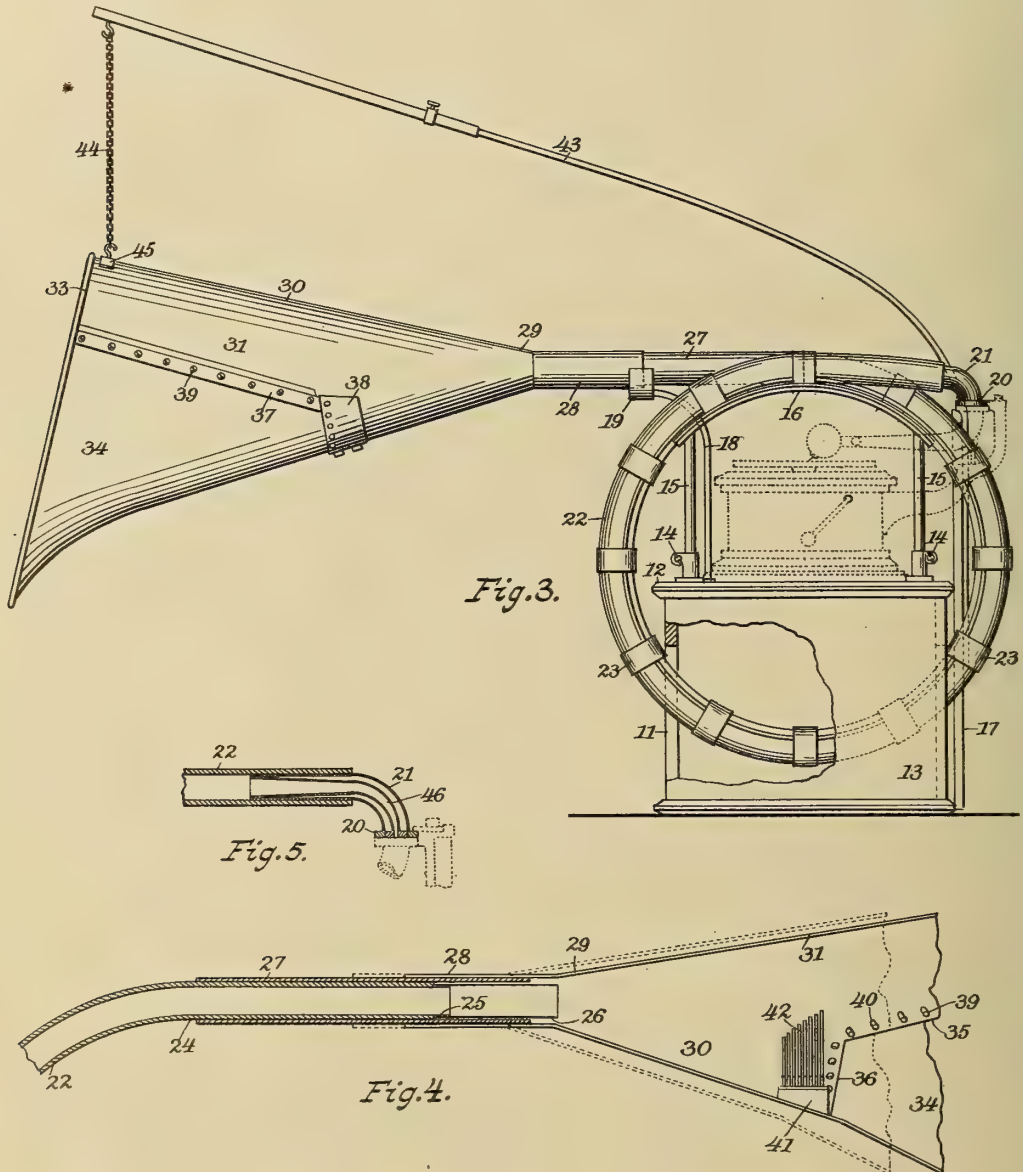


M. G. GRAHAM, DEC'D.
M. A. GRAHAM, ADMINISTRATRIX.
PHONOGRAPH HORN.
APPLICATION FILED NOV. 24, 1908.

1,002,205.

Patented Aug. 29, 1911.

2 SHEETS—SHEET 2.



Witnesses,

Charles S. Reuk
John W. Kelso

Miles G. Graham,
Inventor,

by Geo. L. Cooper
Attorney.

UNITED STATES PATENT OFFICE.

MILES G. GRAHAM, OF ALBANY, NEW YORK; MARY A. GRAHAM ADMINISTRATRIX OF
MILES G. GRAHAM, DECEASED.

PHONOGRAPH-HORN.

1,002,205.

Specification of Letters Patent.

Patented Aug. 29, 1911.

Application filed November 24, 1908. Serial No. 464,203.

To all whom it may concern:

Be it known that I, MILES G. GRAHAM, a citizen of the United States, residing at Albany, Albany county, New York, have
5 invented a new and useful Improvement in Phonograph-Horns, of which the following is a specification.

My invention relates to phonograph horns, or, more broadly, to sound amplifying and resonating devices such as are used
10 on phonographs or other sound reproducing machines.

It is intended to produce a device which shall greatly amplify, purify and resonate
15 the sounds emitted from such machines; which shall particularly adapt such machines to reproduce music originally rendered by an orchestra, whether brass, string or full, as well as the human voice
20 either speaking or singing; and which shall be adjustable as to some of its parts, so as to adapt it more exactly to different uses.

To this end, it consists of many novel features, which may be combined as shown; or they may be, in some cases, employed singly
25 in connection with other well known horns; or they may be united in smaller combinations, *i. e.*, certain parts may be advantageously used without others.

In the example of my invention which I have selected for illustration, Figures 1, 2 and 3 are respectively, a left side elevation,
30 a top plan view and a right side elevation of the device, all partly broken away, and all showing in dotted lines the phonograph or like machine, which forms no part of my invention; Figs. 4 and 5 are partial longitudinal vertical sections of the two end
35 portions of my device.

In the drawings, 11 designates a bench or stand, shown as consisting of a top 12 and two side legs or supports 13, having an opening between them. On the top 12 of
40 the stand are secured two sockets 14, carrying two vertically adjustable legs 15, which support a saddle 16 of arc-shaped, trough-like form. Also secured to the stand 11 is a vertical standard 17, adapted by any well known means, not shown, to detachably
45 engage a horn supporting rod, as will hereafter appear. From the top 12 of the stand rises a rod 18, at the free end of which is a semi-circular horn supporting bracket 19. The stand 11 is intended to support any
50 form of sound recording or reproducing

machine, shown in the present instance as a "Victor" phonograph. To the coupling member of the phonograph is detachably secured in the usual manner, a cooperating coupling member 20, which will of course
60 vary in style to fit the particular machine employed. The tube 21, which is integral with or secured to the member 20, is fitted snugly within the end of a long coiled tube 22, preferably made of rubber, under which
65 term I include rubber coated fabric, as ordinary hose pipe. As shown, the coil consists of a plurality of turns of equal diameter and of a size to encircle the phonograph or like instrument, the ends of the
70 coil extending tangentially, one to engage with the coupling device, the other with a horn, as hereafter described. I have found it advantageous to make this tube of not less than one inch interior diameter and 16
75 feet long, the length of the lowest "C" closed diapason pipe of an organ, though tubes of 8, 4 or 2 feet, or indeed of any multiple of 2 feet, possess certain advantages. I have also found that the resonating
80 or sound carrying capacity of the rubber tube is increased by impregnating its inner surface with a suitable resinous or gum-bearing solution. To this end, I preferably introduce into the tube a quantity of
85 hemlock-spruce oil, turn the tube so as to bring the oil into contact with the entire surface, allow a proper time, say 3 to 5 days, for absorption, and pour out the residue. The tube 22 is coiled so as to loosely
90 embrace the stand top 12 and secured by metal bands 23. The free, tangential, end 24 of the tube 22 is exteriorly cut away to form a portion 25 of reduced diameter, over which is secured a short tube 26 of
95 thin flexible material, as goldbeater's skin, which projects beyond the end of the tube 22. Secured over this tangential end 24 of the tube 22 is a metal sleeve 27, which also projects beyond the end of the tube, but
100 not so far as does the flexible tube 26, which by reason of the reduction of the tube 22, and the consequent annular space between the parts 26 and 27, is free to vibrate for almost its entire length, see Fig. 4. A telescopic sleeve 28, which has a snug sliding
105 fit on the sleeve 27, is integral with or securely connected to the smaller or throat end 29 of a conical horn 30, the body portion 31 of which is best made of copper,

while the sleeve 28 is preferably made of sheet brass, or other metal or alloy. On the sleeve 27 is a series of marks 32 forming a graduated scale for conveniently adjusting or readjusting the longitudinal relations of the tube 22 and the horn 30. see Fig. 2.

A considerable portion of the forward or mouth end of the horn body 31, is cut away, or omitted in making, as shown in Figs. 1, 2, 3 and 4. and a stout circular metal hoop 33, the arc of which corresponds to that of the remaining metal segment, is rigidly secured to the end thereof. The partially flaring conical shape of the horn is restored or completed by means of a segment or gusset of parchment, vellum or like material 34, which is tightly stretched and secured to the free part of the hoop 33 and to the edges 35, 36 of the body 31 of the horn. I preferably secure the segment 34 at the edges of the body 31 by means of flat bars 37 and a curved plate 38, between which and the body 31 the parchment is engaged, the parts 37, 38 being held to the body by small bolts 39 playing in slots 40 in the body 31. By the use of these elongated slots 40, I am enabled at any time to take up any slack or wrinkles which may occur in the segment 34.

Within the metal body portion of the horn 30, and preferably at the rear of the flexible segment or gusset 34, I rigidly secure a block 41 of metal, which supports one or more vibrating gongs 42. I prefer to employ a harmonic series, in the present instance an octave, of such gongs, which may be of desired form, preferably coiled bars, such as are used in cathedral clocks, see Figs. 2 and 4.

As shown in Figs. 1 and 3, the horn 30 is supported at its throat end by the bracket 19, in which the sleeve 28 slides, and at its mouth end by a telescopic rod 43 detachably engaged with the rod or standard 17 and carrying at its free end a chain or cord 44 connected to a loop 45 secured to the upper side of the horn. In practice I find it advantageous to make the horn without the usual flaring metal portion at the mouth end, *i. e.*, with an approximately continuous taper from end to end except as to the parchment portion.

In Fig. 5 of the drawings, I have shown an additional device which I may employ in order to still further amplify the sound. It consists of a tapered tube 46 within the coupling tube 21 and with its smaller end secured to the member 20 so as to register with the aperture therein. The tube 46 may be tapered throughout its length, as shown, or at least at its free end, which is snugly embraced by the tube 21, the tubes 21 and 46 being thus held in concentric relation.

It will be seen that my device in its en-

tirety constitutes what may be called an "orchestraphone," that is, a sound purifying, resonating and tonalifying device adapted to reproduce tones of every pitch and timbre, so that it is particularly adapted to music originally produced by an orchestra containing instruments of various sorts. This adaptation is achieved by the use of the long semi-flexible tube through which the sounds pass and in which scratching and like disagreeable noises appear to be taken up; by the employment of a great variety of vibrating substances, from the light and delicate membrane 26 to the heavy gongs 42, which are acted upon and seem to accentuate notes at different points of the scale; and by the adjustability of the horn 30, by which the membrane 26 may be held within the sleeve portion 28 of the horn or thrust forward a considerable distance into the throat end of the horn itself.

As already stated, the different features of my device as described act cumulatively, so that substantial gains in tone power and sweetness may be obtained even where certain of them are omitted. Hence, I do not wish to be limited to the use of the entire combination shown, or otherwise except as set forth in the claims. It is also clear that many mechanical changes may be made in my device without departing from the spirit of my invention. Thus, the vertical arrangement of the coiled tube, the provision for separating the stand, coil, horn, etc., for packing and for their easy reassembling, and other features of the sort, are within the province of the mechanic.

It will be understood that my device may be used in producing records as well as in sound reproduction, and that the phrase "sound amplifying device" is used in the claims in its broad sense, as including any modification of the tone. The phrase "talking machine" is also used in certain of the claims in its broad sense to include any machine for the production or reproduction of sound records.

What I claim is:

1. In combination, a talking machine; and a sound amplifying member therefor, including a coupling member, a rubber connecting tube attached to said coupling member, the interior surface of said tube being coated with a sound resonating material, and a tapered horn, independent of and connected with the free end of said tube.

2. In combination, a talking machine; and a sound amplifying device therefor, including a coupling member, a rubber connecting tube attached to said coupling member, the interior surface of said tube being coated with a gum-bearing solution, and a tapered horn, independent of and connected with the free end of said tube.

3. In combination, a talking machine; and a sound amplifying device therefor, including a coupling member, a rubber connecting tube attached to said coupling member, 5 the interior surface of said tube being coated with a resinous solution, as hemlock-spruce oil, and a tapered horn, independent of and connected with the free end of said tube.

4. In a sound amplifying device, a rigid, 10 non-collapsible, tapered horn in two parts, one of which is of rigid material and extends the entire length of the horn, and the other of which is of flexible material and of less length than the horn, said rigid part being 15 provided with means for holding said flexible part in permanent stretched position.

5. In a sound amplifying device, a rigid, non-collapsible, tapered horn in two parts, 20 one of which is of metal and extends the entire length of the horn, and the other of which is of tegumentary material and of less length than the horn, said metal part being provided with means for holding said tegumentary part in permanent stretched 25 position.

6. A sound amplifying device including a tube of substantial length; a tube of vibrating membrane secured at the free end of 30 said first named tube; and a tapered horn also mounted at the free end of said first named tube and surrounding said membranous tube.

7. A sound amplifying device including a tube of substantial length; a relatively 35 short tube of thin flexible material, as gold-beater's skin, secured at the free end of said first named tube; and a tapered horn also mounted at the free end of said first named

tube and surrounding said membranous tube. 40

8. A sound amplifying device including a tube of substantial length; a tubular vibrating membrane secured at the free end of 45 said tube and extending therebeyond; and a tapered horn slidably mounted on the free end of said tube, whereby said membrane may have longitudinal movement within the throat of said horn.

9. A sound amplifying device including a tube of substantial length; a sleeve sur- 50 rounding the free end of said tube; a tubular vibrating membrane secured at the free end of said tube, said membrane being of less diameter than said sleeve and projecting 55 therebeyond; and a tapered horn slidably mounted on said sleeve.

10. In a sound amplifying device, a coupling member having a central aperture; an outer tube rigidly secured to said member; 60 and an inner tapered tube having its smaller end secured to said member and connected with said aperture and having its free flared end located within said outer tube.

11. In a sound amplifying device, a coupling member having a central aperture; 65 an outer tube secured to said member; and an inner tapered tube having its smaller end secured to said member and having its free flared end located within and bearing 70 against said outer tube, whereby said tubes are held in concentric relation.

MILES G. GRAHAM.

Witnesses:

GEO. R. KEHOE,

JOHN H. KELSO.

1002, 972

J. W. AYLSWORTH.
 PROCESS OF MAKING DUPLICATE SOUND RECORDS.
 APPLICATION FILED JAN. 29, 1908.

1,002,482.

Patented Sept. 5, 1911.

Fig. 1

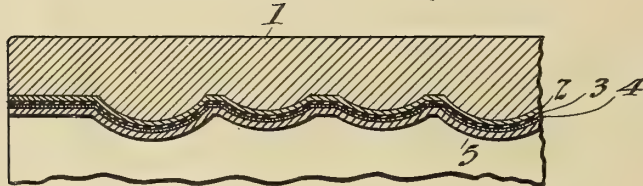


Fig. 2

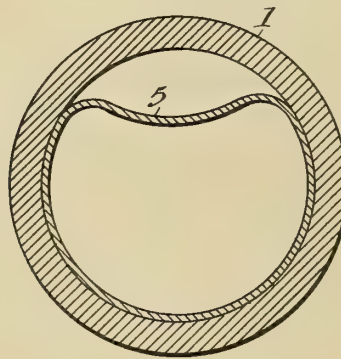


Fig. 3

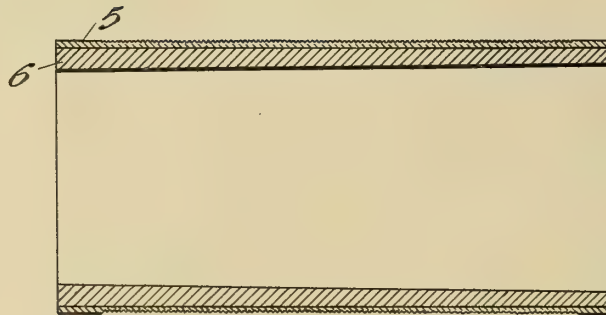


Fig. 4



Witnesses:

Frank D. Lewis
Herbert A. Dyke

Inventor:

Jonas W. Aylsworth
by Frank L. Dyke
Atty.

UNITED STATES PATENT OFFICE.

JONAS W. AYLSWORTH, OF EAST ORANGE, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

PROCESS OF MAKING DUPLICATE SOUND-RECORDS.

1,002,482.

Specification of Letters Patent.

Patented Sept. 5, 1911.

Application filed January 29, 1908. Serial No. 413,168.

To all whom it may concern:

Be it known that I, JONAS W. AYLSWORTH, a citizen of the United States, residing at 223 Midland avenue, East Orange, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Processes of Making Duplicate Sound-Records, of which the following is a description.

My invention relates to an improved duplicate sound record made of metal, or provided with a metallic wearing surface, and to an improved process of making the same, the object of the invention being to provide such a metallic record which shall be a very close copy of an original master, and to provide a process or method of producing them, which shall be capable of being carried out commercially in an effective way. Cylindrical sound records at the present time are generally made of a wax-like material molded or cast within a hollow matrix, and disk records are formed of a somewhat harder material employing considerable quantities of shellac, the impression being secured from a flat matrix. In either case, the records are subject to wear which would be very largely increased if the attempt were made to materially diminish the size of the record groove. Cylindrical and disk records have also been made of a tough material, like celluloid, but such records are generally of poorer quality than those formed of a wax-like material, and they also appear to deteriorate with time. Moreover, a celluloid record would be subjected to objectionable wear if the attempt were made to materially diminish the size of the record groove. The making of duplicate copies of sound records in metal has also been suggested, but in every case so far as I am aware, when this has been done, the matrix has been destroyed so that the process would be obviously unsuited for use for the commercial manufacture of metallic duplicates.

In order that the invention may be better understood, attention is directed to the ac-

companying drawing, forming part of this specification, and in which—

Figure 1, is a section of a cylindrical mold many times enlarged and illustrating the duplication from a master having a record groove only three-thousandths of an inch in width, a portion of a metallic film being illustrated as being formed in the mold; Fig. 2 a cross-sectional view of a matrix or mold illustrating the manner of removing the duplicate record therefrom; Fig. 3 a longitudinal sectional view showing a complete cylindrical record with a metallic wearing surface; and Fig. 4 a corresponding view showing a disk record with a metallic wearing surface.

In all of the above views, corresponding parts are represented by the same numerals of reference.

The matrix 1 shown in Fig. 1, is of the usual construction, being formed on its interior with a negative representation of a master record, and being produced by electroplating in any ordinary or suitable way. When the record to be duplicated is of disk form, the usual matrix for the purpose will be employed. I propose to electroplate a metallic film on the negative record surface of a matrix, whether of disk or cylindrical form, and in order to prevent the electrodeposited coating from adhering intimately to the matrix, I first coat the latter with an excessively thin non-metallic film, which while it will adhere sufficiently to permit the electrodeposit to be made, will, with relative facility, permit the electrodeposit to be stripped free of the record surface. Preferably, for this purpose I form upon the record surface of the matrix, an excessively thin non-metallic film produced by exposing the surface for a short time to the smoke or vapor of a highly heated resin gum, resulting in the deposit on the record surface of a microscopically thin layer thereof, substantially coherent and uniform throughout and of such relative thinness as not to interfere with the minute details of the record surface. The matrix, while it is

being thus exposed to the vapor of a highly heated hydrocarbon, may advantageously be connected to a source of static electricity which attracts the smoke or vapor and facilitates the formation of a more uniform film on the record surface thereof. When an excessively thin non-metallic film has been applied in this way to the record surface, I apply to the same a thin film of very finely divided graphite which is lightly burnished with a soft brush so as to thereby remove all particles which do not adhere to the non-metallic film.

In the drawing, 2 represents the usual ~~nickel or gold deposit which is electroplated on the matrix so as to reduce oxidation~~, 3 the non-metallic film, and 4 the conducting film of graphite, all of these films, however, being somewhat exaggerated in thickness for the purpose of clearness. Having treated the matrix in this way, it is now placed in an electroplating bath and connected as a cathode, and a sufficiently thick layer of nickel or cobalt, or other relatively non-oxidizable metal is plated on the graphite film, so as to thereby form the layer 5, which constitutes the metallic surface of my improved record. This deposit may be given any desired thickness, say from one-hundredth to one-tenth of an inch, or more. During this plating the ends of the matrix as well as its outer surface, may be protected by a coating of varnish, paraffin, or other suitable material, so as to prevent the electrodeposition of the metal on any part of the matrix, except its record surface. Having obtained a metallic shell carrying on its surface the positive representation of the record to be duplicated, I remove the same from the matrix in any suitable way. When the matrix is flat, obviously the deposited record may be simply lifted off or stripped off by prying a sharp instrument between it and the matrix, but when the deposit is made in a tubular matrix, it is collapsed inwardly, as shown in Fig. 2, and, in this way, removed. After the electrodeposited shell or disk has been obtained in this way, it is mounted on a suitable cylindrical backing 6 (Fig. 3) or flat backing 7, (Fig. 4).

In constructing cylindrical records, the backing may be conveniently formed of plaster of Paris, which is cast within the shell in any suitable way, or the backing may be formed of papier-mâché, or other very cheap material, over which the electrodeposited material may be slipped, so as to be held in place by friction. In the manufacture of disk records the electrodeposit may be cemented or otherwise secured to a disk of paper or other cheap material. In every case, the material comprising the sup-

port or backing should have a relatively low coefficient of expansion, in order that any expansion or contraction to which it may be subjected will be within the elastic limits of the metallic film.

Records made as I have described can be manufactured with relative facility and are able to withstand enormously greater wear than is possible with duplicate records as now made, and this is so even when the record groove is of as fine a width as three-thousandths of an inch.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is as follows:—

1. The process of making metallic duplicates of sound records, consisting in first applying to the negative record surface of a matrix or mold, a thin film of a non-metallic relatively non-adherent material, in applying a conducting material to said film, and in electroplating a metal on the conducting material, and in finally separating the electrodeposited metal from the matrix, substantially as set forth.

2. The process of making metallic duplicates of sound records, which consists in applying to the negative record surface of a suitable matrix an excessively thin deposit of a hydrocarbon in finely divided condition, then in applying a conducting material to such a deposit, then in electroplating a metal on the conducting material and in finally removing the electrodeposited metal from the matrix, substantially as and for the purposes set forth.

3. The process of making metallic duplicates of sound records, which consists in subjecting the record surface of a suitable matrix to the vapor or smoke of a highly heated hydrocarbon, so as to produce an extremely thin coating of hydrocarbon in excessively finely divided condition on the record surface, then in applying thereto a conducting material, then in electroplating a metal on the conducting material, and in finally separating the electrodeposited metal from the matrix, substantially as and for the purposes set forth.

4. The process of making metallic duplicates of sound records, which consists in applying an excessively thin film of hydrocarbon in extremely finely divided condition on the record surface of a suitable matrix, then in applying a suitable conducting material thereto, then in lightly burnishing the conducting material, then in electrodepositing a metal on the conducting material, and finally in separating the electrodeposited metal from the matrix, substantially as set forth.

5. The process of making metallic duplicates of sound records, which consists in

connecting a suitable metallic matrix to a source of static electricity, then in subjecting the record surface to the effect of a hydrocarbon vapor, so as to deposit a thin
5 film of excessively finely divided hydrocarbon particles on the record surface, then in applying a conducting material to said film, then in electroplating a metal on said conducting material, and in finally separating

the electrodeposited metal from the matrix, 10 substantially as and for the purposes set forth.

This specification signed and witnessed this 21 day of Jan. 1908.

JONAS W. AYLSWORTH.

Witnesses:

FRANK D. LEWIS,
ANNA R. KLEHM.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

E. L. AIKEN.

PHONOGRAPH.

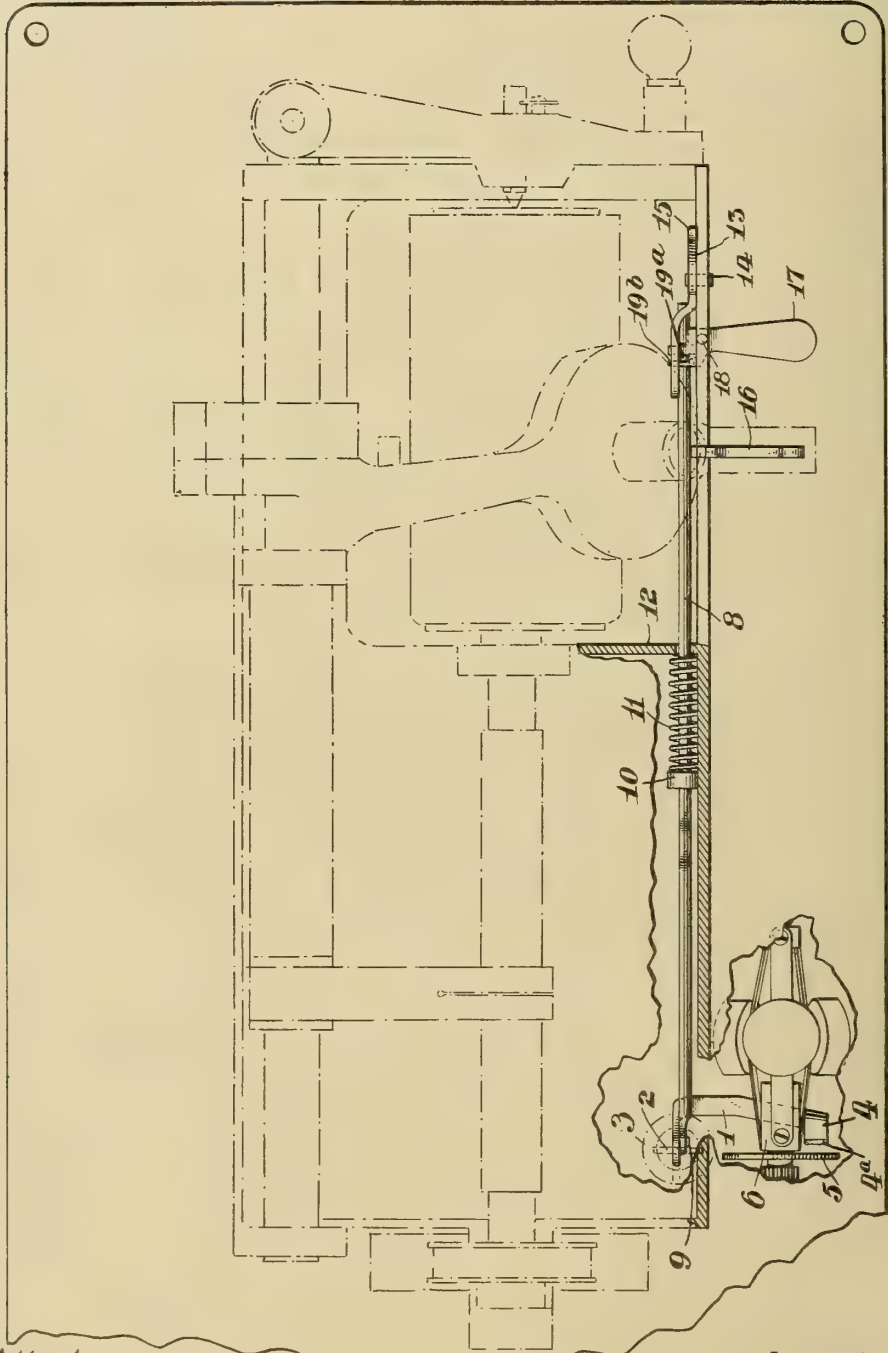
APPLICATION FILED JUNE 28, 1905.

1,002,479.

Patented Sept. 5, 1911.

2 SHEETS—SHEET 1.

Fig. 1.



Attest:

Edgeworth Curran
Delos Holden

Inventor:

Edward L. Aiken
by *Frank L. Spear* Atty.

E. L. AIKEN.
PHONOGRAPH.

APPLICATION FILED JUNE 28, 1905.

Patented Sept. 5, 1911.

2 SHEETS—SHEET 2.

1,002,479.

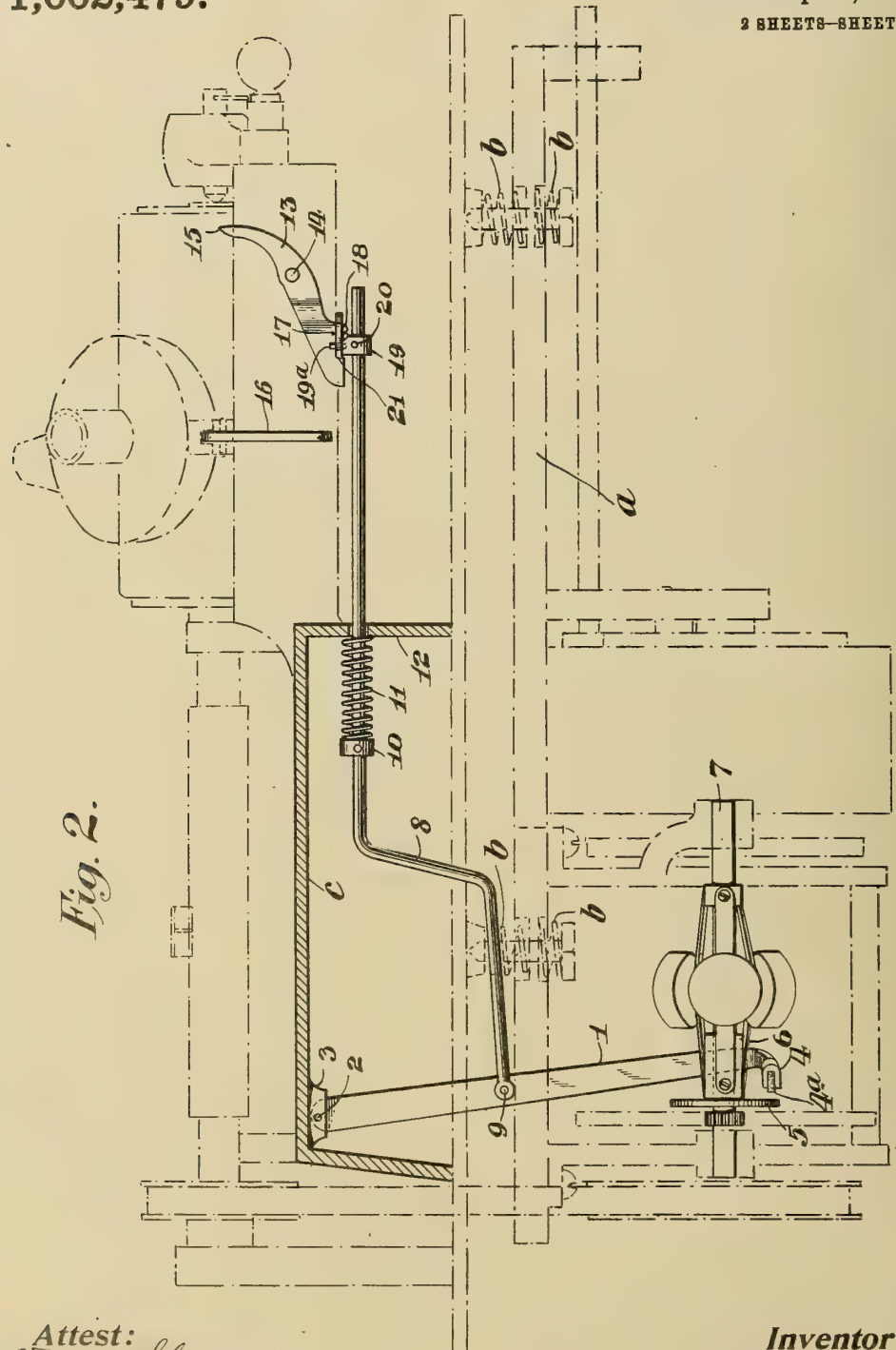


Fig. 2.

Attest:
Edgeworth
DeLos Holden

Inventor:
Edward L. Aiken
by *Frank L. Myer* Att'y.

UNITED STATES PATENT OFFICE.

EDWARD L. AIKEN, OF EAST ORANGE, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

PHONOGRAPH.

1,002,479.

Specification of Letters Patent.

Patented Sept. 5, 1911.

Application filed June 28, 1905. Serial No. 267,337.

To all whom it may concern:

Be it known that I, EDWARD L. AIKEN, a citizen of the United States, residing at East Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Phonographs, of which the following is a description.

My invention relates to phonographs and similar talking machines, on which provision is made for automatically stopping the rotation of the mandrel when the end of the record has been reached, and more particularly to instruments of this character in which a spring motor is used for furnishing the driving power.

My invention has for its object the application of such means to phonographs as now built and on the market, preferably in such a way that the device will be for the most part concealed so as not to detract from the appearance of the instrument.

My invention also has for its object to simplify the construction in such a manner that the brake which is automatically applied for stopping the spring motor will also act as a frictional member for determining the speed of rotation of the motor during the operation of the instrument.

With these ends in view my invention consists in the features hereinafter set forth and claimed.

Reference is hereby made to the accompanying drawing, in which—

Figure 1 is a plan and Fig. 2 a front elevation showing in dotted lines a phonograph of ordinary construction and in full lines one form of device in which my invention may be embodied together with those parts of the phonograph to which it is applied and with which it cooperates.

In the device shown, a lever 1 is pivoted at 2 to a lug 3 secured to or integral with the body of the instrument. The lower end of the lever extends laterally from the body thereof and is formed with a socket 4 for receiving a piece of felt or other yielding material 4^a to be pressed against the face of the disk 5 carried in a well known manner by the sleeve 6 of the governor shaft 7. During the operation of the instrument the lever 1 occupies the position illustrated in the drawing, whereby the felt 4^a is withdrawn into such a position as to allow the motor to start and gain speed until the face

of the disk 5 is brought into frictional engagement therewith, at which time the motor will be running at such speed as to produce the usual number of revolutions per minute of the mandrel, and will be prevented from gaining additional speed. The lever 1 is normally held in the position shown, by a rod 8 pivoted thereto at 9 and extending longitudinally of the instrument. A collar 10 is fixed to an intermediate portion of the rod and a coil spring 11 surrounds the same, being placed between the said collar and the vertical web 12 of the body of the instrument. The tension of the spring tends to move the rod 8 longitudinally toward the left and thereby press the block 4^a of the lever 1 against the governor disk 5 to stop the motor. The rod 8 is, however, normally held against such movement by a latch 13 pivoted at 14 to the frame and having a portion 15 which projects in the path of the rear portion of the lift lever 16. One end of the rod 8 is provided with a collar 19, secured thereto by a pin 20, and having a vertical pin 19^a. A lever 17 is pivoted at 18 to the frame, and has a slot 19^b to receive the pin 19^a. The rod 8 is held against the tension of the spring 11 by the shoulder 21 of the latch 13 against which the short arm of the lever 17 presses.

It will be obvious that when the lift lever 16 reaches the projection 15 of the latch 13 it will cause the same to turn on its pivot 14, whereby the shoulder 21 will be raised above the end of the lever 17 and the tension of the spring 11 will thereupon draw the rod 8 toward the left, thereby causing the block 4^a carried by the lever 1 to be pressed against the governor disk 5 and to thereby stop the motor. The pin 19^a is always in engagement with the lever 17, and the latter is useful as a hand lever for placing the spring under tension when it is desired to operate the phonograph. It can be dispensed with, if desired, in which case the rod 8 will carry a projection or shoulder for engagement with the shoulder 21 of the latch 13. Obviously the projection 15 may, if desired, be replaced by a longitudinally adjustable rod, so that the latch 13 may be tripped at any desired position with respect to the record carried by the mandrel.

It should be noted that the attachment described is carried entirely by the main

frame or body *c* of the phonograph and is not connected in any way with the motor frame *a*. The frame *a* is preferably floated between springs *b, b*, so that vibrations set up by reason of the operation of the motor and gearing will not be transmitted to the body of the instrument, which means for supporting the motor frame is described and claimed in Letters Patent No. 798,478, dated Aug. 29, 1905. Consequently, the insulation of the body of the instrument from the vibrations set up by the motor is not interfered with by the application of the present invention to the instrument.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a phonograph, the combination of a body, a motor, a traveling carriage actuated thereby, a member rotatable by the said motor, a pivoted lever movable into engagement with said member, a longitudinally movable rod attached at one end to said lever and having its opposite end projected without said body, means within said body tending to move the rod longitudinally a hand lever connected to said rod pivotally, a latch for normally holding the lever against the force of said means, said latch having an arm projecting into the path of the carriage, substantially as set forth.

2. In a device of the class described, the combination of the motor having a sliding governor disk, a longitudinally movable rod, a friction pad adapted to engage said disk and connected to said rod, a spring applied to said rod and adapted to cause the pad to engage said disk and stop the motor, and holding means connected to said movable rod, and comprising a hand lever for placing said spring under stress and a latch for holding said lever against the action of the spring, substantially as set forth.

3. In a phonograph or allied talking machine, in combination with the main frame or body carrying springs and a traveling sound box carriage, of a motor frame floated between said springs, driving mechanism including a motor, governor and governor disk

carried by said motor frame, and releasable means carried by the body of the instrument and out of contact with the motor frame for pressing against said governor disk to stop the motor, said means being released by the sound box carriage, substantially as set forth.

4. In a phonograph or allied talking machine, in combination with the main frame or body carrying springs and a traveling sound box carriage, of a motor frame floated between said springs, driving mechanism carried by said motor frame, and releasable means carried by said body and out of contact with said motor frame for stopping the motor, said means being released by the sound box carriage, substantially as set forth.

5. In a phonograph or allied talking machine, in combination with the main frame or body carrying springs, and a traveling sound box carriage, of a motor frame supported by said springs, driving mechanism including a motor, governor and governor disk carried by said motor frame, and releasable means carried by the body of the instrument and out of contact with the motor frame for pressing against said governor disk to stop the motor, said means being released by the sound box carriage, substantially as set forth.

6. In a phonograph or allied talking machine, in combination with the main frame or body carrying springs, and a traveling sound box carriage, of a motor frame supported by said springs, driving mechanism carried by said motor frame, and releasable means carried by said body and out of contact with said motor frame for stopping the motor, said means being released by the sound box carriage, substantially as set forth.

This specification signed and witnessed this 26th day of June 1905.

EDWARD L. AIKEN.

Witnesses:

DELOS HOLDEN.

FRANK L. DYER.

F. L. DYER.
PROCESS OF MAKING METALLIC DUPLICATE SOUND RECORDS.
APPLICATION FILED JAN. 27, 1908.

1,002,659.

Patented Sept. 5, 1911.

Fig. 1

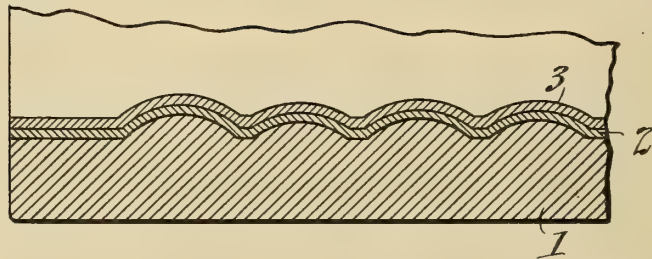


Fig. 2

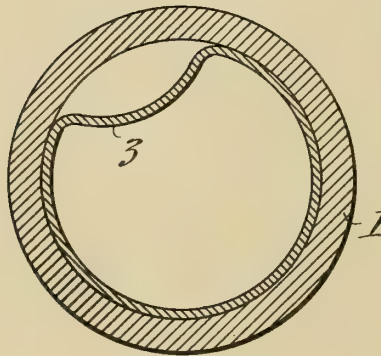
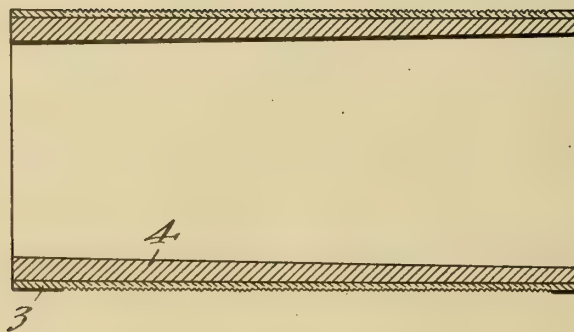


Fig. 3



Witnesses:
Frank D. Lewis
Herbert H. Dyke

Inventor:
Frank L. Dyer

UNITED STATES PATENT OFFICE.

FRANK L. DYER, OF MONTCLAIR, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

PROCESS OF MAKING METALLIC DUPLICATE SOUND-RECORDS.

1,002,659.

Specification of Letters Patent.

Patented Sept. 5, 1911.

Application filed January 27, 1908. Serial No. 412,741.

To all whom it may concern:

Be it known that I, FRANK L. DYER, a citizen of the United States, residing at Montclair, county of Essex, and State of New Jersey, have invented a certain new and useful Process of Making Metallic Duplicate Sound-Records, of which the following is a description.

My invention relates to an improved process for making metallic duplicate sound records, whether of cylindrical or disk type, and my object is to provide a very simple process which can be carried out on a commercial scale for the production of an unlimited number of accurate metallic duplicates from a single mold or matrix. Metallic duplicates thus made will permit the effective production and reproduction of a record of very great fineness, say, of three thousandths of an inch, or less in width.

The invention resides in the fact that by producing on the record surface of the matrix or mold an excessively thin coherent layer of so-called "cement copper," and by electroplating the metal thereon, the adhesion between the particles of cement copper and between the latter and the matrix or mold, on the one hand and the electrodeposited metal on the other, is so slight as to permit the ready separation of the electrodeposited metal, after which any of the cement copper adhering thereto, or to the mold, can be easily rubbed off. When the mold or matrix is of a tubular form, the electrodeposited metal will exist as a shell and can be removed by collapsing the shell inwardly, but when the matrix or mold is in the form of a flat disk, the electrodeposited metal can be freely stripped off of the same. The shell or disk obtained in this way, carrying the representation of the record to be duplicated, is supported on a suitable foundation.

In order that the invention may be better understood, attention is directed to the accompanying drawing, forming part of this specification, and in which

Figure 1 is a sectional view on an enlarged scale, of a portion of the matrix or mold with its film of cement copper deposited on the record surface thereof, and with the electrodeposited layer constituting the record surface of the duplicate; Fig. 2 a cross-sectional view illustrating the manner

of removing the electrodeposited shell from the tubular mold; Fig. 3 a longitudinal sectional view of the composite cylindrical record with a metallic surface.

In the above views, corresponding parts are represented by the same numerals of reference.

The mold 1, is of any suitable character, being either tubular or of disk form, and is provided with the usual negative record surface, as shown. I place the mold in a suitable cobalt plating bath, preferably a concentrated solution of cobalt chlorid with cobalt anodes, and plate on the record surface an exceedingly thin film or blush of cobalt 2, which may be less than .0001 of an inch in thickness. During this plating, the mold is preferably rotated so as to make the plating uniform. The mold is now washed and is then immersed in a solution of copper sulfate, the reaction causing the cobalt to go into the solution and the copper to be deposited as "cement copper" in a minutely granular but slightly adhesive form. Preferably, the immersion is continued only long enough to result in the covering of the cobalt film with a perfect layer of cement copper, so as to leave a part of the cobalt film still intact. If all the cobalt were dissolved in the copper sulfate bath, there might be danger of the electrodeposited film being plated imperfectly at first, since it is deposited under a condition of tension, but it will be understood of course, that if desired, the entire film of cobalt may be reduced to cement copper. Instead of first depositing on the mold a thin blush of cobalt, as explained, any other metal might be used in connection with which substantially the same reactions take place, for instance, iron. Having coated the record surface of the matrix or mold with an excessively thin film of cement copper, as explained, I now electroplate upon such film, a heavier deposit 3, of a suitable metal, upon which the record is to be made. This is preferably nickel, owing to its non-oxidizing properties. Preferably, during the operations which have been described, the matrix or mold, except for its record surface is protected by a coating of varnish or paraffin, or some similar material, so that the plating operations will be confined to the record surface. The shell or disk of nickel or other

metal, which has thus been formed (depending, of course, whether the mold is tubular or disk-like) is removed, which can be readily effected, owing to the slightly adhesive character of the film of cement copper. When the mold is tubular, the shell is preferably collapsed, as shown in Fig. 2. Having obtained a shell or disk of electro-plated metal, carrying an accurate copy of the record to be duplicated, it is now supported on a suitable foundation 4, of plaster-of-Paris, or papier mâché. It will be understood that in order to facilitate the stripping of the electrodeposited duplicate from the matrix, the matrix with the electroplated deposit in position, may be subjected to a thirty to forty per cent. solution of cyanid of potash, by which the cement copper will be dissolved, so as to entirely free the electrodeposited layer, but ordinarily this is not necessary, since the adhesion of the particles of cement copper is so slight as to permit the electrodeposited layer to be readily stripped from the matrix or mold.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is as follows:—

1. A process for making metallic duplicate copies of sound records, which consists in applying to the record surface of a matrix or mold, a very thin film of granular slightly adhesive cement copper, in electroplating a thin and relatively non-oxidizable metal thereon, and in finally separating the electrodeposited metal from the matrix or mold, substantially as and for the purposes set forth.

2. A process for making metallic duplicate copies of sound records, which consists in applying to the record surface of the matrix or mold, an excessively thin film of cobalt, in then subjecting the deposited film to a copper solution to thereby result in the formation of granular slightly adhesive cement copper, in electrodepositing on the cement copper a heavier layer of metal, and in finally removing the latter deposit, substantially as and for the purposes set forth.

3. A process for making metallic duplicate copies of sound records, which consists in rotating a matrix or mold in a cobalt plating bath, and in depositing on the record surface of the matrix or mold an excessively thin film of cobalt, in then subjecting the cobalt film to a copper solution, resulting in the formation of granular slightly adhesive cement copper film, in then electrodepositing a metal thereon, and in finally removing the electrodeposited metal, substantially as and for the purposes set forth.

4. A process for making metallic duplicate copies of sound records, which consists in electroplating on the record surface of a matrix or mold an excessively thin film of cobalt, in subjecting said film to the effect of

a copper solution so as to convert a part only of the film to granular slightly adhesive cement copper, in then electroplating a metal thereon, and in finally removing the electrodeposit, substantially as and for the purposes set forth.

5. A process for making metallic duplicate copies of sound records, which consists in applying to the record surface of the matrix or mold, an excessively thin film of a metal having the power to replace copper in a copper solution, in then subjecting the deposited film to a copper solution to thereby result in the formation of granular slightly adhesive cement copper, in electrodepositing on the cement copper a heavier layer of metal, and in finally removing the latter deposit, substantially as and for the purposes set forth.

6. A process for making metallic duplicate copies of sound records, which consists in rotating a matrix or mold in a plating bath and in depositing on the record surface of the matrix or mold an excessively thin film of the metal the salt of which is in solution in the bath, the metal being one having the power to replace copper in a copper solution, in then subjecting the film so deposited to a copper solution resulting in the formation of a granular slightly adhesive cement copper film, in then electrodepositing a metal thereon, and in finally removing the electro-deposited metal, substantially as and for the purposes set forth.

7. A process for making metallic duplicate copies of sound records, which consists in electro-plating on the record surface of a matrix or mold an excessively thin film of a metal having the power to replace copper in a copper solution, in subjecting said film to the effect of a copper solution so as to convert a part only of the film to granular slightly adhesive cement copper, in then electroplating a metal thereon, and in finally removing the electro-deposit, substantially as and for the purposes set forth.

8. A process for making metallic duplicate copies of sound records, which consists in applying to the record surface of the tubular matrix or mold an excessively thin film of a metal having the power to replace copper in a copper solution, in then subjecting the deposited film to a copper solution to thereby result in the formation of granular slightly adhesive cement copper, in electrodepositing on the cement copper a heavier layer of metal to form a positive record, and in finally removing the latter from the mold and the cement copper by collapsing the same, substantially as and for the purposes set forth.

9. A process for making metallic duplicate copies of sound records which consists in applying to the record surface of a matrix or mold, a very thin film of granular

slightly adhesive cement copper, and electro-
plating a thin deposit of metal thereon, in
dissolving out the cement copper by a solu-
tion of cyanid of potash, and finally sep-
5 arating the electro-deposited material from
the matrix or mold, substantially as and for
the purpose set forth.

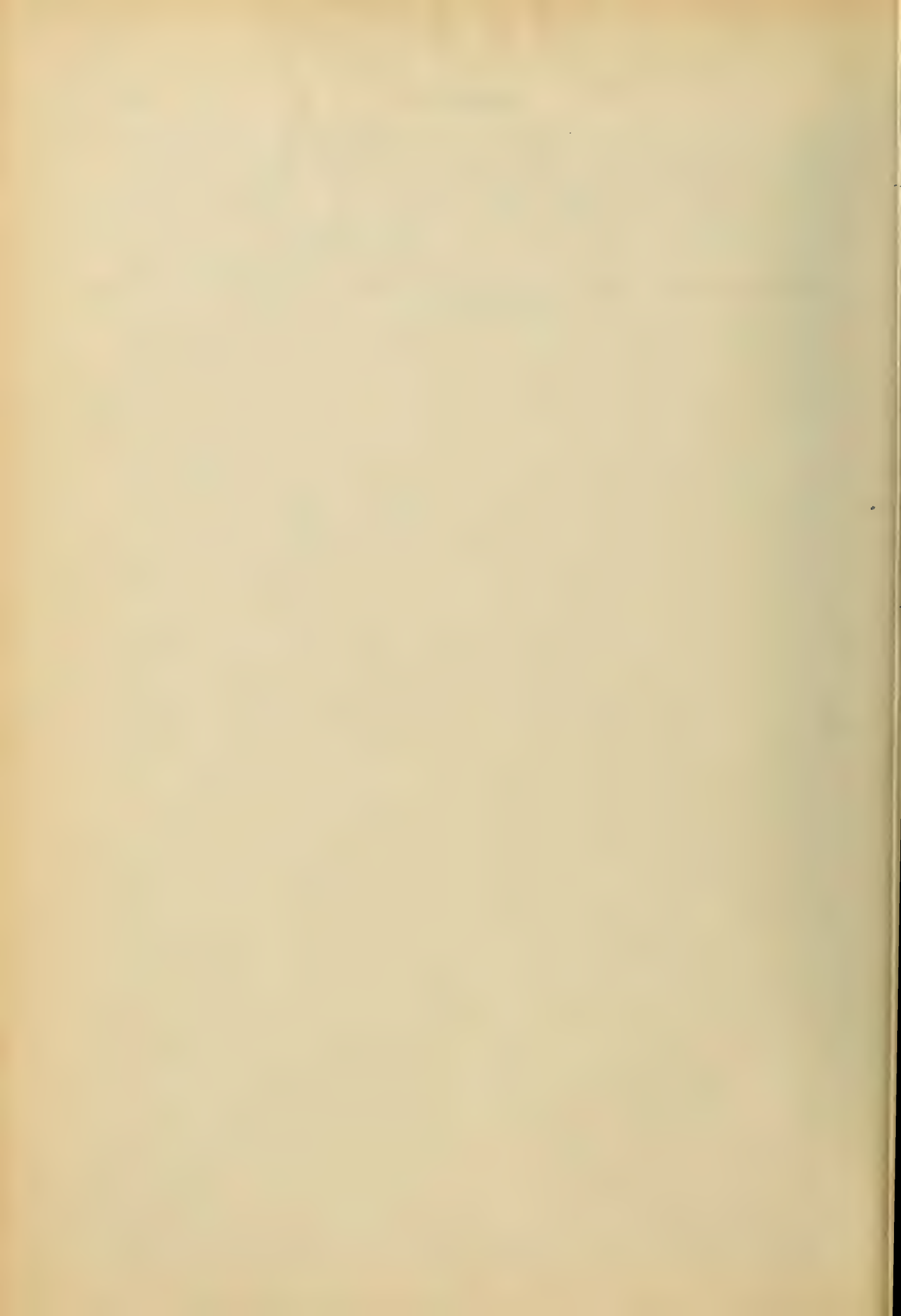
This specification signed and witnessed
this 25 day of Jan. 1908.

FRANK L. DYER.

Witnesses:

ANNA R. KLEHM,
FRANK D. LEWIS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,
Washington, D. C."

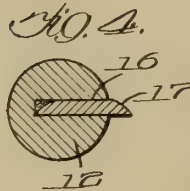
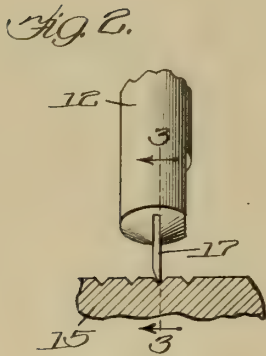
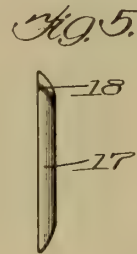
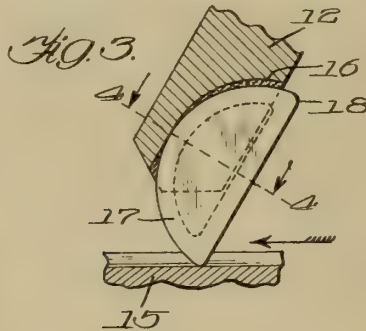
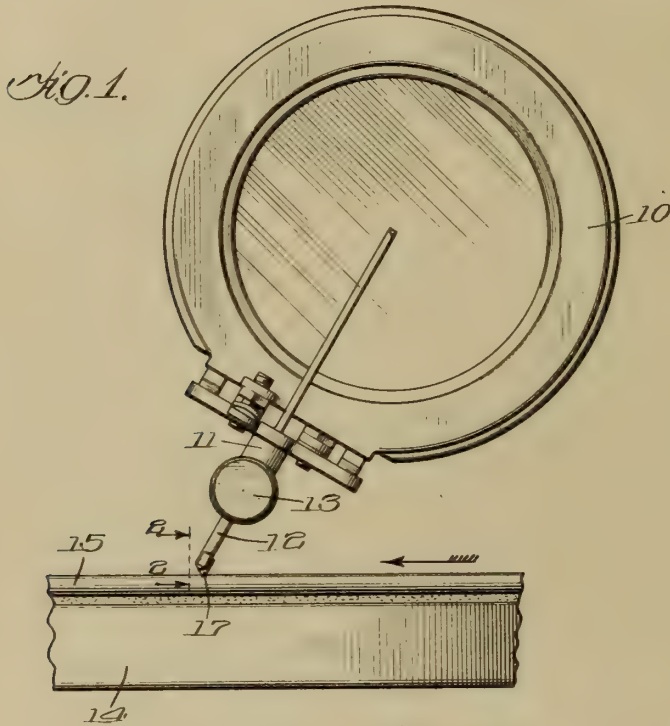


1000

S. LEVIN.
 STYLUS FOR SOUND REPRODUCING MACHINES.
 APPLICATION FILED SEPT. 19, 1910.

1,003,474.

Patented Sept. 19, 1911.



Witnesses:
Ed. D. Long
Geo. H. Nelson

Inventor:
Samuel Levin
 by *Bras Adams Picard & Jensen*
 Attys

UNITED STATES PATENT OFFICE:

SAMUEL LEVIN, OF HIGHLAND PARK, ILLINOIS.

STYLUS FOR SOUND-REPRODUCING MACHINES.

1,003,474.

Specification of Letters Patent.

Patented Sept. 19, 1911.

Application filed September 19, 1910. Serial No. 582,674.

To all whom it may concern:

Be it known that I, SAMUEL LEVIN, a citizen of the United States, residing at Highland Park, in the county of Lake and State of Illinois, have invented certain new and useful Improvements in Styli for Sound-Reproducing Machines, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to styli for sound-reproducing machines of the gramophone type, and has for its object to produce a new and improved form of stylus which may be used a great many times without injury either to the stylus or to the disk record so that the operator is relieved of the necessity of changing the stylus at each operation as is necessary in the use of a stylus of the ordinary type. I accomplish this object by the use of a stylus having a jewel point of a peculiar form, as illustrated in the drawings and hereinafter specifically described.

That which I believe to be new is set forth in the claims.

In the drawings,—Figure 1 is a fragmentary side view of the rotary table and record disk of an ordinary gramophone, with the ordinary reproducer in position thereon with the stylus engaging the sound-groove in the record, the view being toward the center of the rotary table. Fig. 2 is an enlarged detail, being a very much enlarged section on the line 2—2 of Fig. 1, and showing the sound-groove in the record. Fig. 3 is a still more enlarged detail, being an enlarged section on line 3—3 of Fig. 2. Fig. 4 is a section on line 4—4 of Fig. 3. Fig. 5 is a view of the jewel as seen from the right in Fig. 3.

Referring to the several figures of the drawings, in which the corresponding parts are indicated by like reference characters,—10 indicates a reproducer of the ordinary general type, of which 11 indicates the socket-member in which the stylus 12 is to be inserted, being retained in position therein by the set-screw 13.

14 indicates the rotary table upon which the sound-record 15 is revolved in the direction indicated by the large arrow in Fig. 1.

As best shown in Figs. 3 and 4, the stylus proper or stem 12 is provided with a deep groove 16 at one side at the lower end. 17 indicates a jewel secured in said groove by

means of cement or in any other suitable manner. As best shown in Fig. 3, the jewel is substantially in the shape of a semi-circle, with the straight side of the jewel set at an angle of approximately sixty degrees to the face of the record, and with the curved portion of the periphery of the jewel in advance in the direction of the movement of that portion of the record with which the jewel is in contact. That is to say, the straight edge of the jewel is first brought into contact with the successive variations in the record groove. The edge of the jewel which is toward the center of the record is rounded off (see Figs. 2, 4 and 5) so that the jewel is in effect substantially plano-convex, the edge which is toward the outside being also very slightly rounded as are also the points of the jewel, as best shown at 18 in Fig. 3.

I have found by experience that a stylus of this character is very efficient. The sound-groove of the record does not become quickly worn but on the contrary the record still retains its superiority after having been used a great many times with a single stylus. The jewel is large enough in cross-section to insure its being not easily broken, and its peculiar shape with the flat face outside enables the stylus to traverse the groove many times following closely the original sinuous outline without materially wearing away the fine points along the sides of the groove. Moreover, I have found that as the jewel is gradually worn, the wear is such as to preserve substantially the original shape of the engaging point of the jewel.

What I claim as my invention and desire to secure by Letters Patent is,—

1. A stylus for sound-reproducing machines of the gramophone type, the operative point of which is plano-convex, the edge of said point which first engages the variations of the record groove being straight and set at an angle to the face of the record.

2. A stylus for sound-reproducing machines of the gramophone type, the operative point of which is formed of a thin substantially plano-convex jewel whose lower pointed end is defined by a straight line and a curved line, said jewel being positioned so that its straight edge first engages the variations of the record groove in the rotation of the record, said straight edge being set at an angle to the face of the record.

3. A stylus for sound-reproducing machines of the gramophone type, the operative

point of which is formed of a thin substantially plano-convex jewel whose lower pointed end is defined by a straight line and a curved line, said jewel being positioned
5 so that its straight edge first engages the variations of the record groove in the rotation of the record, said straight edge being at an angle to the face of the record the convex face of said jewel being positioned toward the center of the record.

10 4. A stylus for sound-reproducing machines of the gramophone type, the operative point of which is formed of a semi-circular plano-convex jewel having its edges
15 and its points slightly rounded, said jewel being positioned so that its straight edge first engages the variations of the record groove in the rotation of the record, said straight edge being at an angle to the face of
20 the record.

5. A stylus for sound-reproducing machines of the gramophone type, the operative point of which is formed of a semi-circular plano-convex jewel having its edges
25 and its points slightly rounded, said jewel being positioned so that its straight edge first engages the variations of the record groove in the rotation of the record, said straight edge being at an angle to the face
30 of the record, the convex face of said jewel

being positioned toward the center of the record.

6. A stylus for sound-reproducing machines of the gramophone type, comprising a stem and a thin substantially semi-circular plano-convex jewel secured to the lower
35 end of said stem with the straight edge substantially parallel with the stem.

7. A stylus for sound-reproducing machines of the gramophone type, comprising a
40 stem and a thin substantially plano-convex jewel secured to the lower end of said stem, the lower pointed end of said jewel being defined by a straight line and a curved line, said straight edge being substantially parallel
45 with the stem.

8. A stylus for sound-reproducing machines of the gramophone type, comprising a stem and a thin substantially plano-convex jewel secured to the lower end of said stem,
50 the lower pointed end of said jewel being defined by a straight line and a curved line, said straight edge being substantially parallel with the stem, the operative point and the edges of said jewel being slightly
55 rounded.

SAMUEL LEVIN.

Witnesses:

C. E. PICKARD,
W. H. DE BUSK.

T. H. MACDONALD.
 DICTAPHONE RECORDER AND REPRODUCER.
 APPLICATION FILED JULY 28, 1910.

1,003,625.

Patented Sept. 19, 1911.

Fig. 1.

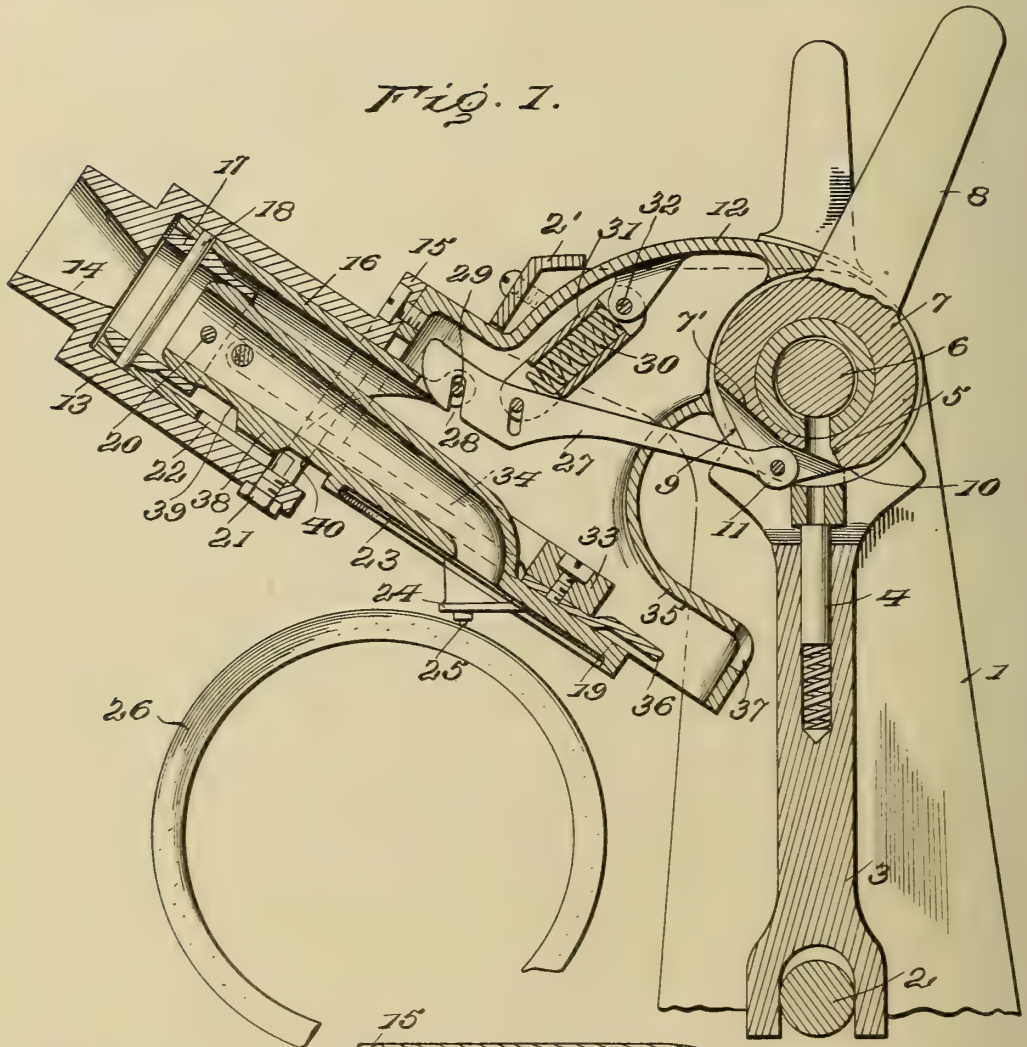
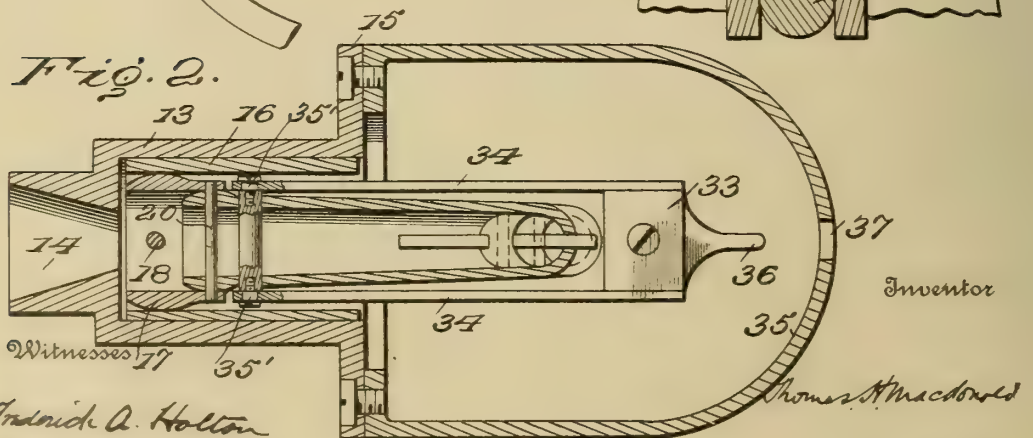


Fig. 2.



Frederick A. Holton
 Lillie E. Atkins

By Messrs. Cameron, Kerr & Hesse Attorneys

UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO AMERICAN GRAPHOPHONE COMPANY, OF BRIDGEPORT, CONNECTICUT, A CORPORATION OF WEST VIRGINIA.

DICTAPHONE RECORDER AND REPRODUCER.

1,003,625.

Specification of Letters Patent. Patented Sept. 19, 1911.

Application filed July 28, 1910. Serial No. 574,314.

To all whom it may concern:

Be it known that I, THOMAS H. MACDONALD, of Bridgeport, Connecticut, have invented a new and useful Improved Dictaphone Recorder and Reproducer, which invention is fully set forth in the following specification.

This invention relates to talking machines designed for dictation purposes where it is desirable to have the recorder and the reproducer combined in a single instrument, to the end that the operator may readily shift from recording to reproducing, or vice versa, and more particularly the invention relates to the recording and reproducing element, or, as it is now technically known in the art, the combined recorder and reproducer. In this art, it is recognized that the recording device should be lighter than the reproducing device, or, to express it another way, that the recording device should exert less pressure upon the record than does the reproducing device. It has, therefore, been proposed to make the recorder-reproducer with a single diaphragm having a recording stylus and a reproducing stylus mounted thereon and to provide means for shifting the recorder-reproducer so as to bring either one of the styles into operative relation with the record at will. It has also been proposed to mount a weight directly upon the recorder-reproducer and fixedly secured thereto, the relation of the parts being such that when the recorder-reproducer is adjusted into reproducing position the weight exerts a greater pressure through the style upon the record than it does when the recorder-reproducer is adjusted into recording position.

In my application Serial No. 150,811, filed August 29, 1908, I have shown and described, among other things, a recorder-reproducer having a single diaphragm provided with a recording and a reproducing style and means for shifting the recorder-reproducer so as to bring either style into operative relation with the record; and I have shown, cooperating with such recorder-reproducer, a weight mounted independent of the recorder-reproducer and, therefore, independent of the diaphragm mounting, with means for adding the weight to the recorder-reproducer, and hence also to the dia-

phragm, when the instrument is in reproducing position, and removing the weight therefrom when the instrument is in recording position.

My present invention is an improvement on that shown in my said application and it consists, generally speaking, in a combined recorder and reproducer having a single diaphragm with two stylus points secured thereto and a weight pivotally mounted directly upon the recorder-reproducer (instead of independent thereof as in my former application), with means for relieving the recorder-reproducer of the greater part of the weight when the instrument is in recording position and for applying the entire weight to the recorder-reproducer when the same is in reproducing position.

More specifically stated, the invention consists of a combined recorder-reproducer of the character last described with a weight having its main portion located approximately over the recording and reproducing styles and provided with a plurality of arms connected by a suitable pivot to the recorder-reproducer at or near the neck portion thereof.

I have shown the invention in the accompanying drawings, in which:

Figure 1 is a vertical section through the carriage of an ordinary dictating graphophone showing the combined recorder-reproducer in reproducing position, and Fig. 2 is a substantial horizontal section through the combined recorder and reproducer and its connecting part.

Referring to the drawings, in which like reference numerals indicate like parts, 1 is a supporting standard, 2 is a horizontal guide rod, 3 is a guide arm carrying the plunger 4 and partial nut 5 for engaging feed screw 6. A ring 7 enters the cut-away portion of the feed nut 5 and is supported on feed screw 6 and operated by lever 8. The ring 7 has two cut-away parts or fingers 9 and 10 with a nose 11 at the junction of said parts. When the nose 11 bears on the plunger 4, it depresses it and disconnects the nut from the feed screw, but when either of the parts 9 or 10 is opposite the cut-away portion in the nut 5, the spring plunger 4 throws the nut into engagement with the feed screw 6 and the machine is operated thereby, all as

shown and described in my U. S. Letters Patent 569,290, dated October 13, 1896.

The casing 12 of the carriage has a tubular piece 13 secured thereto by flange 15, and receiving the tube of the mouth piece at its reduced end 14. Tube 16 telescopes within the tube 13 and is capable of longitudinal movement with relation thereto. The trunnion tube 17 is pivoted within the tube 16 by pivot pin 18, while the recorder-reproducer 19 is secured to the inner end of the trunnion tube 17 by the horizontal pin 20 which permits the recorder-reproducer to move up and down on said pivot. A set screw 21 passes up through the bottom wall of the fixed tube 13 and through the longitudinal slot 22 of the telescoping tube 16, thus permitting the telescoping tube 16 to have free longitudinal movement, while the pin 21, by reason of its engagement in the slot 22, prevents any axial or turning movement of the tube 16. The diaphragm 23 has a recording style 24 and a reproducing style 25 in position to operatively engage the record 26. The diaphragm mounting consists of a piece, preferably of metal, having a tubular opening 19' formed therein with the diaphragm secured opposite one end of said opening in the usual or any suitable manner, said mounting, as previously described, being carried on the transverse pivot 20. The said mounting, the diaphragm, and the two styles 24 and 25 together constitute the recorder-reproducer as a whole. A link 27 is pivoted to the ring 7 at the nose 11 and is provided with a slot 28 engaging a horizontal pin 29 on the telescoping tube 16, the link 27 and pin 29 being held in engagement by spring 30 mounted within tubular part 31 pivoted at 32 to the casing 12 and secured at its lower end by pivot and slot engagement to the link 27.

Referring to the pin 21 (Fig. 1), the same is in a position to coöperate with a cam face 38 having on the opposite sides thereof two seats 39 and 40. When the pin is in the seat 40, the reproducing point is in operative relation with the record; when the cam face 38 rests upon the pin 21 the recorder-reproducer is lifted from the record so that neither style contacts therewith; and when the pin 21 is in the seat 39 the recording style 24 is in operative relation with the record.

As thus far described, the construction is the same as that shown, described and claimed in my aforesaid application Serial No. 450,811. The essential difference between the construction of the present invention and that shown in my said application resides in the novel manner of mounting the weight. The weight in the present instance consists of the part 33 and its rearwardly extending arms, 34, 34, which arms instead of being pivoted to the frame of the ma-

chine independently of the recorder-reproducer or the diaphragm mounting, are pivoted directly upon the recorder-reproducer or diaphragm mounting, thereby simplifying the construction and, as experience has proved, producing equal if not better results. As in the construction of my aforesaid application, the weight is provided with a nose 36 adapted to engage the adjacent seat 37 in the casing 12.

The operation will be understood by referring to Fig. 1, where the parts are shown in reproducing position. When the lever 8 is adjusted into vertical position, the link 27 will throw the telescopic tube 16 forward and with it the recorder-reproducer until the cam 38 of the recorder-reproducer rests upon the pin 21, thus elevating the reproducing style from the record and, of course, elevating the weight 33, 34, 34. The continued shifting of the lever from the vertical position to the left in Fig. 1 will advance the parts to the point where the nose 36 will engage the seat 37 in the frame 12, while the seat 39 of the recorder-reproducer will come opposite the pin 21, thus permitting the recorder-reproducer to descend, bringing the recording style 24 into contact with the record. By shifting the lever 8 in the reverse direction, the reverse movement will be secured, thus withdrawing the nose 36 of the weight 33, 34, 34 from the seat 37 and permitting the parts to return into the position shown in Fig. 1. It will thus be seen that the greater and most effective portion of the weight is withdrawn from the recorder-reproducer when the same is in recording position, but is returned to the recorder-reproducer when in reproducing position, thus automatically obtaining the desired result, viz., a recorder that is comparatively light and a reproducer that is comparatively heavy.

Having thus described my invention, what is claimed is:

1. In a sound recording and reproducing machine, an instrument comprising a single diaphragm and a mounting therefor, two stylus points mounted upon said diaphragm one for recording and the other for reproducing, in combination with a weight mounted directly upon the diaphragm mounting and wholly supported thereby during the reproducing operation and means other than the diaphragm mounting for supporting a portion of the weight for the recording operation and for returning it to the diaphragm mounting for the reproducing operation.

2. In a sound recording and reproducing machine, a combined recorder and reproducer, a carriage, pivotal connections between said recorder and reproducer and the carriage, a weight pivoted directly upon the recorder-reproducer adjacent to the pivot

point of the latter and supported wholly
upon the recorder-reproducer when in repro-
ducing position, and means withdrawing a
portion of said weight from the recorder-
5 reproducer when the parts are in recording
position.

In testimony whereof I have signed this

specification in the presence of two sub-
scribing witnesses.

THOMAS H. MACDONALD.

Witnesses:

EDNA THORPE,

A. B. KEOUGH.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,
Washington, D. C."

1,003. 65V

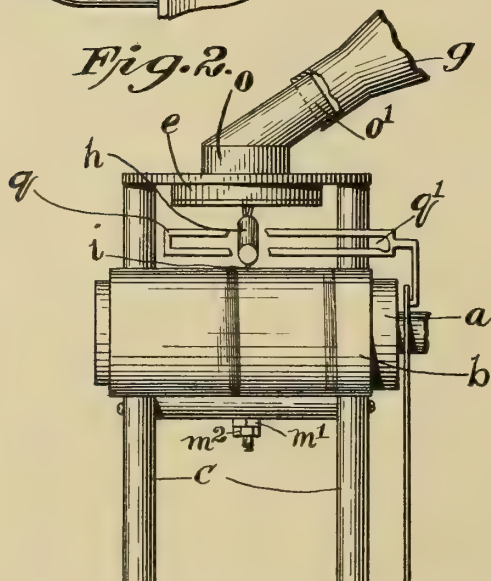
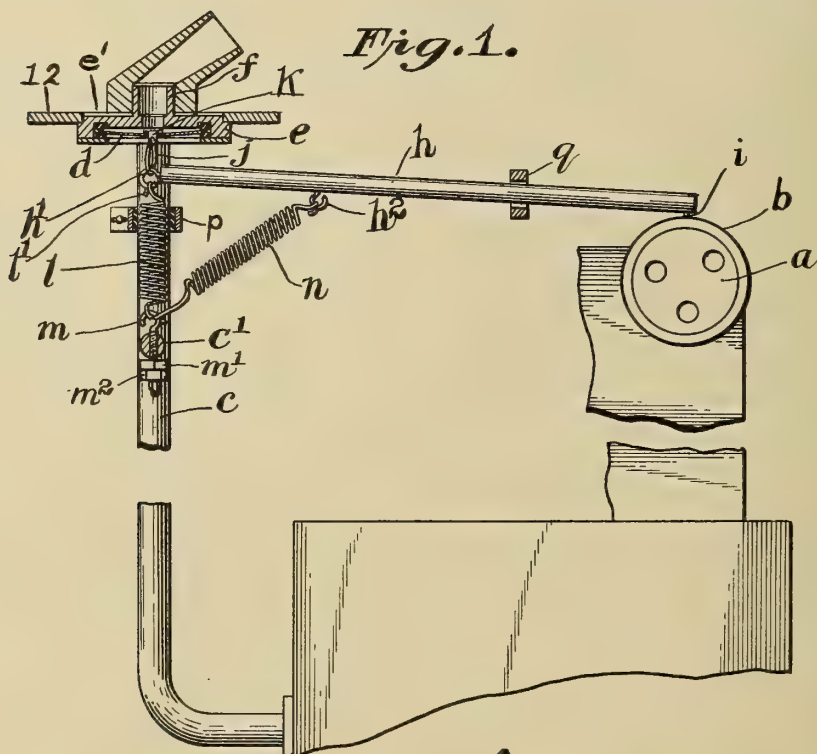
C. B. REPP.
PHONOGRAPH.

APPLICATION FILED JUNE 24, 1909.

1,003,655.

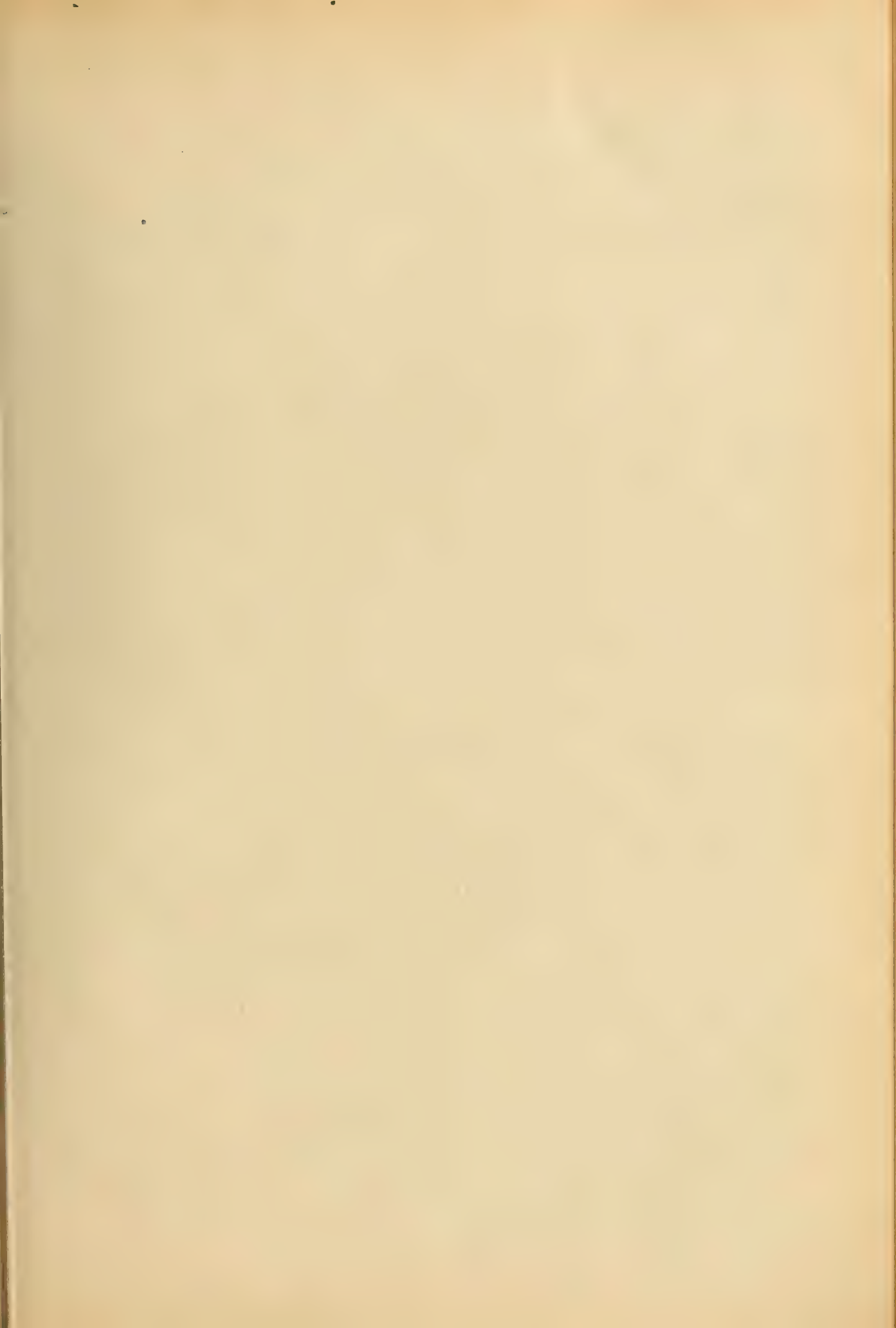
Patented Sept. 19, 1911.

2 SHEETS—SHEET 1.



Attest:
B. S. Daniels
P. O. Kering.

Clinton B. Repp, Inventor:
by Frank P. Wentworth
his Atty.



C. B. REPP.
PHONOGRAPH.

APPLICATION FILED JUNE 24, 1909.

1,003,655.

Patented Sept. 19, 1911.

2 SHEETS—SHEET 2.

Fig. 3.

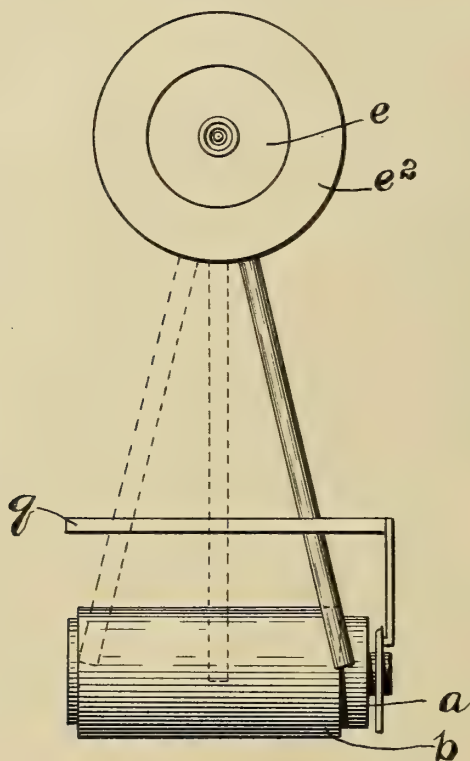
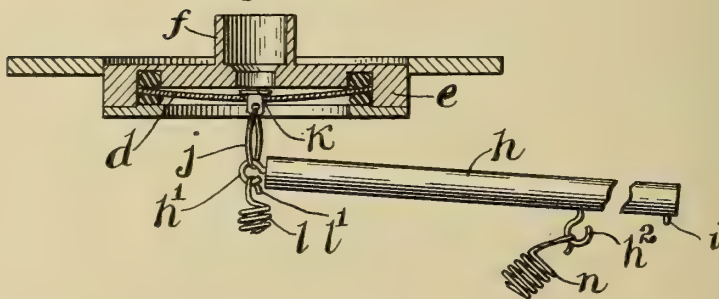


Fig. 4.



Attest:
B. S. Daniels
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Clinton B. Repp Inventor:
by Frank T. Wentworth
his Atty.

UNITED STATES PATENT OFFICE.

CLINTON B. REPP, OF NEW YORK, N. Y., ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF ONE-HALF TO WILLIAM E. COOK, OF ROXBURY, MASSACHUSETTS.

PHONOGRAPH.

1,003,655.

Specification of Letters Patent. Patented Sept. 19, 1911.

Application filed June 24, 1909. Serial No. 503,978.

To all whom it may concern:

Be it known that I, CLINTON B. REPP, a citizen of the United States, residing in the borough of Manhattan, in the city, county, and State of New York, have invented certain new and useful Improvements in Phonographs, of which the following is a specification, reference being had therein to the accompanying drawings, which form a part thereof.

My invention relates to phonographs, and more particularly to the mechanism relating to sound translation.

The main object of the invention is to provide a phonograph wherein the sound waves of the record will be accurately transmitted to, and reproduced by, a diaphragm with a large volume of resultant sound waves so modified as to have clearness of tone as well as accuracy of reproduction, all vibrations other than those due to the indentations upon the record being eliminated or lost during the transmission of the vibrations from the reproducer point to the diaphragm.

A further object is to provide a phonograph wherein any cross vibrations due to the movement of, or actuating mechanism for imparting movement to, the diaphragm and its sound box will be eliminated or avoided.

A still further object is to provide a phonograph wherein the diaphragm may be placed and maintained under a constant tension to insure such sensitiveness to vibrations thereof as will secure the interception of even minute vibrations with a resultant clear, and exact reproduction of the sound waves represented by the indentations upon the record, with every detail accentuated.

A still further object is to provide a phonograph wherein the diaphragm will be placed under a constant tension, and said tension may be varied or regulated to attune the diaphragm and the various parts of the instrument incidental to the transmission of the vibrations from and reproduction of the sound waves defined by the record.

A still further object is to provide a phonograph wherein the diaphragm and its sound box will be fixed relative to the record,

and the reproducer point and the vibratory members interposed between the said point and the said diaphragm will be capable of such movement relative to the record as will permit the reproducer point to follow the spiral trend of the indentations of the record.

A still further object is to provide a phonograph wherein the diaphragm and its sound box will be fixed relative to the record, and the reproducer point will be propelled along the record through its engagement with the indentations therein, the vibrations set up by such engagement being transmitted to the diaphragm by interposed vibratory members the first of which carries said reproducer point and has a swiveling relation to the diaphragm.

A still further object is to provide a phonograph wherein the pressure of the reproducer point will be entirely independent of the means tensioning the diaphragm.

A still further object is to provide a phonograph wherein the various parts incidental to the tensioning of the diaphragm and the exertion of pressure of the reproducer point upon the record will be so constructed and arranged as not to divert or absorb vibrations of the vibratory members, or set up cross vibrations resulting in false tones in the sound reproduction due to the action of these vibrations upon the diaphragm.

A still further object is to provide a phonograph embodying therein a fixed diaphragm and a vibrator arm extending radially thereof, and capable of movement about the axis of said radius, wherein the movement of said arm will be positively defined to prevent a displacement of parts, or injury to the reproducer point through contact with metallic parts of the instrument.

A still further object is to provide a phonograph wherein the vibrations set up by the indentations in a record will be transmitted by the reproducer point to a rigid member capable of transmitting such vibrations to the diaphragm, said point being carried by and firmly attached to said member in a manner to cause all vibrations to be transmitted by the point to said member without

likelihood of the loss of any sound waves, or the modification of the length of such vibrations. And a still further object is to provide a phonograph which may be inexpensively produced and which will reproduce sounds in great volume, and with accuracy.

The invention consists primarily in a phonograph embodying therein a diaphragm, means placing same under tension, a reproducer point and a vibratory member between said point and said diaphragm, whereby the vibrations resulting from the engagement of said point with indicated sound waves on a record will be transmitted from said point to said diaphragm through said vibrator member; and in such other novel features of construction and combination of parts as are hereinafter set forth and described and more particularly pointed out in the claims hereto appended.

Referring to the drawings:—Figure 1 is a side elevation of a phonograph embodying my invention, the diaphragm and its sound box being shown in vertical section; Fig. 2 is a front view thereof; Fig. 3 is a plan view thereof, and Fig. 4 is an enlarged sectional detail view of the diaphragm, sound box, interposed vibrator member and reproducer point.

Like letters refer to like parts throughout the several views.

In the accompanying drawings, I have not shown and I will not describe in detail, the mechanism rotating the record, it being apparent that any record actuating means may be employed, this invention having to do with the transmission of the vibrations necessary to reproduce through the diaphragm, those waves recorded upon the wax or other cylinder.

In the drawings, the support for the record is shown as an ordinary mandrel *a* which may be rotated about a horizontal axis by means of any desired mechanism. The record shown at *b* is of the ordinary cylinder type.

Off-set relative to the axis of the mandrel *a* and cylinder *b*, is a supporting frame *c* for the diaphragm *d* and its sound box *e*. The construction and arrangement of the sound box *e* may be the same as now ordinarily used, differing therefrom, however, in the respect that the diaphragm does not carry the reproducer point. The center of the sound box is about midway between the ends of the mandrel *a* and its contained record *b*, and is immovable relative thereto. The sound box *e* has the ordinary sound opening and outlet *f* adapted to receive the horn *g*. The manner of attachment of this horn, however, differs from that of the ordinary phonograph in that it may be turned completely around to any point without interfering with the connection between the horn

and the outlet. A detailed description of this manner of mounting the horn will be more fully entered into hereinafter.

The sound box being distant from the record, it is apparent that some means for transmitting the vibrations indicated on the record must be provided, which means will have the two-fold function of carrying the vibrations and following the record, or the indentations thereon which have a spiral trend. The essentials of this interposed vibratory transmitting mechanism are susceptibility of responding readily to the vibrations produced by the sound record without absorbing such vibrations, and adaptability of movement circumferentially of the diaphragm without interrupting such vibrations. This mechanism embodies therein a vibrator arm *h* the outer end of which carries the reproducer point *i* which point is firmly secured to and in intimate contact with said arm so as to transmit the vibrations thereto, either by being firmly embedded therein alone, or by means of a metallic mounting, and the inner end of said arm is mounted relative to the center of the diaphragm *d* in a manner to transmit the vibrations from said arm to said diaphragm, the connection being such as to permit a swiveling or rotary movement of said arm circumferentially of said diaphragm. The arm *h* may be made of any desired material taking any desired form although by experiment I have demonstrated satisfactorily that a soft, close-grained wood, such as bass wood, or American linden, results in not only an exact reproduction of the sound vibrations through the absence of cross-tones or blasts, but modulates these tones so as to result in a softness or sweetness in the reproduced tones without diminishing their volume. Preferably the connection between the inner end of the arm *h* is by means of a strand *j* of waxed thread secured to a headed stud *k*, the head of which bears upon the diaphragm *d* and the stem of which has an opening therein through which the strand *j* is looped. It will be observed that this strand is flexible, thus permitting the arm *h* to turn readily through that arc necessary to bring it into engagement with all parts of the record *b*. The twisting of the strand *j* while impairing the transmission of the vibrations to a certain extent, does not otherwise effect the mode of operation of the device.

To permit the transmission of the vibrations of the arm *h* to the diaphragm *d* through the strand *j* it is necessary to tauten this strand, which tautening also accomplishes the tensioning of the diaphragm itself in a manner to make it extremely sensitive. The agency employed for accomplishing this tautening of the strand and tensioning of the diaphragm must be so arranged

as not to interfere with the free swiveling movement of the arm *h*. Preferably this means consists of a coiled spring *l* one end of which is formed into an open loop or hook which is passed through a loop or hook *h'*, which is the connecting means or agency between the arm *h* and the strand *j*. The other end of this spring is secured to a hook or loop *m* mounted in a cross-head *c'* of the frame *c*, the said cross-head *c'* being directly below the center of the diaphragm *d*.

The tension of the diaphragm *d* will be controlled by the tension of the spring *l*, and as the sound reproduction may be controlled through the tension of said diaphragm, I preferably provide means for varying the tension of the said diaphragm through a variance in the tension of the spring *l*. This adjustment is accomplished by making the shank of the hook or loop *m* screw-threaded and passing it through an opening in the cross-head *c'*, the nut *m'* and lock nut *m''* being used for drawing said hook or loop toward the cross-head to increase the tension of the spring *l* or permit the tension of the spring *l* to draw said loop toward the diaphragm, and locking said hook or loop in the adjusted position. The open hook *h'* at the top of the spring *l* is for the purpose of preventing the deadening of the vibrations or the formation of cross-vibration at the point of connection between said spring and said arm. The hook or loop *h'* is made large in order to provide that clearance necessary to permit the hook to turn freely, relative to both the strand *j*, or hook or loop *h'*.

If desired, other connecting means between the arm *h* and the diaphragm *d*, and other means tensioning the diaphragm may be employed without departing from the spirit and scope of the invention.

In order to cause the outer end of the arm *h* and the reproducer point carried thereby to exert the required pressure upon the record *b*, means exerting a downward pressure upon said arm must be employed. To avoid the necessity for always having the phonograph upon a level, this means preferably consists of a coiled spring *n*, the opposite ends of which respectively are formed into hooks and attached to the open hook or loop *m*, and a hook *h''* upon the arm *h* adjacent to the inner end thereof. The connections between the spring *n* and the hooks or loops *m* *h''* respectively must be such as to permit the swiveling movement of these parts relative to each other, which may be accomplished in the simplest form by means of looped connections having such clearance as will avoid a tight fit and a consequent binding at this point.

It will be observed that the spring *l* is attached to the same lower center as the hook *n*, thus causing the axis of rotation of

the arm *h* and its pressure spring to be the same.

The top of the sound box *e* is provided with a circular recess *e'* having an outer flange *l''* in which recess *e'* is mounted a fitting *o* having an enlarged base and an angularly projecting tube *o'* adapted to carry the horn. The opening in the base of the fitting *o* has a close sliding fit to the casing forming the sound opening *f*, the said fitting being attached to the sound box by means of this fit so that the horn may be turned in any direction being capable of describing a complete circle about the sound outlet or opening *f*.

To prevent as much as possible the vibrations of the spring *l* with resultant cross-tones or blasts, from the diaphragm, I use a muffler upon said spring consisting of a flange *p* having a resilient lining such as soft rubber, in contact with said spring, without exerting sufficient pressure thereon to effect the tension of the spring. This muffler is not essential to the operation of the device, but may be used to secure the highest efficiency by the elimination of all vibrations upon the diaphragm other than those passing through the vibrator arm *h*.

To place limitations upon the movement of the arm *h* both its rotary movement and its vertical movement in order to prevent accidental injury to the reproducer point by engagement with the mandrel *a* or other parts of the phonograph other than the record *b*, I provide a guide *q* composed of a frame adjacent to the outer end of the said arm *h* which frame has a slot therein through which the said arm passes. This slot is of a width so as to be free of the arm *h* when said arm is in operative engagement with the record *b*, allowing additional clearance above said arm to permit the reproducer point to be raised out of engagement with the record and brought to the starting point. The clearance below said arm is merely enough to prevent the engagement of the arm therewith when the reproducer point is in engagement with the record, thus causing the lower edge of said slot to support the arm at other times. Beyond the starting point of the record, I form a recess *q'* in said support in order to retain the arm at this point. The frame *q* may be made of any desired material inasmuch as it has no function in the reproduction of sound, being merely a safety device for preventing injury to the reproducer point. It is arranged adjacent to the mandrel in order to reduce the leverage in shifting the arm which might result in injury to the diaphragm.

The operation of the herein described phonograph is substantially as follows:—The record *b* being placed upon the mandrel *a* and the mechanism rotating said mandrel

and record being set in motion, the reproducer point *i* is placed upon the right hand side of the record as shown in Fig. 2, in engagement with the first of the indentations in said record. As the record rotates, the indentations or indicated sound waves thereon will set up vibrations in said point *i* which vibrations will be transmitted to the arm *h* along which they will pass to the inner end thereof, where they will be transmitted through the strand *j* to the diaphragm *d*, the vibrations of which diaphragm will in the usual manner produce sound waves coinciding with those indicated upon the record *b*. The point *i* being firmly mounted upon and in intimate contact with the arm *h*, no cross vibrations will be caused by the movement of said point, and inasmuch as the arm *h* is free from end to end from contact with any rigid matter, the vibrations will be uninterrupted and will be modified only by the material of this arm which will aid to modulate same in a manner to cause a rich, round, full reproduction of the sound waves by the diaphragm. The spring *n* will cause the point to exert sufficient pressure upon the record to insure a responsive vibration to even the most minute variance in the wave indication, thus insuring accuracy in the slightest detail in the reproduction of sound from the record. The tensioning of the diaphragm *d* will make this diaphragm extremely sensitive and cause it to pick up and respond to every slight vibration transmitted through the arm *h*, thus carrying the accuracy and detail of the reproduction throughout the entire machine. The sharpness of the tone reproduced by the diaphragm *d* may be governed by the tension placed upon said diaphragm as by increasing said tension, I have found that the volume of the tone is increased, as well as its intensity, up to a certain point beyond which it increases merely in intensity. The use of a strand *j* made of waxed cord produces the sweetest tones as, the elasticity of gut serves to deaden the tones somewhat, and the use of metal, to impart a metallic characteristic to the sound reproduction. The direction of the pressures exerted by the springs *l n* causes a substantially axial pull upon the diaphragm and causes the arm *h* to rotate while traversing the record about an axis in alinement with the axis of the diaphragm or substantially so, according to the pressure exerted by the spring *n*.

The reproducer point on the arm *h* being in constant engagement with the indentations on the record, and all the strains on said arm being concentrated in the axis of rotation of said arm, the outer end of said arm is free to rotate or move laterally under the control of the said indentations which have a spiral trend so as to impart this movement.

It will be observed that the sound box be-

ing stationary, is not subject to any vibrations whatever, excepting those transmitted to the diaphragm therein contained through the vibrator mechanism interposed between this diaphragm and the reproducer point and that thus the likelihood of external influence upon the diaphragm to create false vibrations thereof is reduced to a minimum. In fact the reproduced tones from my phonograph as herein described are entirely free from that scratching and those false blasts commonly found in phonographs, the elimination of which is one purpose of the invention.

The outer end of the arm *h* in following the record describes an arc as indicated in Fig. 3 of the drawings, but the fact that the reproducer point departs from the same radius throughout the record is immaterial, inasmuch as its engagement with the indentations is continuous and the reproducer point alone projects into said indentations and the outer end of the arm *h* does not contact at any time with the record.

The operation of the adjustment mechanism is apparent, its function being solely to control the pressure exerted upon the diaphragm to place it in tension so as to secure the best quality of sound reproduction and eliminate any variance in the tension which might be due to the inequality of different springs in different machines.

The guide *g* as heretofore stated, has no function in the reproduction of sound having no operative engagement with the arm *h* while it, said arm, is connected with the record. It is designed merely to prevent a careless operator from injuring the reproducer point or disturbing the adjustment of the machine.

The various connections between the springs, the arm *h*, the strand *j*, and the cross-head *c'* are made large in order to secure the desired swiveling action without loosely connected parts.

By placing a muffler upon the spring *l* any vibrations which might otherwise be transmitted through said spring will be cut off, thus causing all vibrations to be concentrated within the diaphragm and these vibrations to be confined strictly to those of the vibrator mechanism interposed between the diaphragm and the reproducer point.

By the use of a close, straight-grain wood, I avoid blasts due to the material of the wood, and any cross vibrations therein, and thus cause such regular uninterrupted vibrations of the diaphragm *d* itself as to secure a fine tone to the reproduced sounds.

The construction and arrangement of the fitting *o* not only directs the reproduced sound waves to the trumpet, but avoids loose parts at this point, while permitting the tones to be directed to any point about the sound opening or outlet *f*.

It is not my intention to limit the invention to the precise details of construction, shown in the drawings, it being apparent that my invention may be modified to adapt
 5 it to any type of phonograph. I believe it to be broadly new to provide a sound box and its contained diaphragm having no movement whatever relative to the record and to transmit the sound waves to the record,
 10 by means of a vibrator carrying a reproducer point adapted to engage the record and extended to and connected with the diaphragm in a manner to permit said vibrator member to traverse the record automatically,
 15 and I intend to claim such broadly. I also believe it to be new to provide a diaphragm which is under tension aside from that being produced in setting the diaphragm in the sound box, and the action thereon of the
 20 reproducer point and I also intend to claim such broadly.

Having described the invention, what I claim as new and desire to have protected by Letters Patent, is:—

25 1. In a phonograph, an amplifier, a flexible member attached thereto, means exerting a pressure upon said amplifier through said flexible member, whereby said amplifier is placed under constant direct tension, and
 30 a vibrator member carrying a reproducing member attached to said flexible member.

2. In a phonograph, a diaphragm, means exerting a pressure on said diaphragm whereby said diaphragm is placed under
 35 constant and direct tension and means transmitting sound vibrations to said diaphragm, said tensioning pressure being applied to said diaphragm in a direction opposite to the direction of movement of said sound
 40 vibrations in passing to said diaphragm.

3. In a phonograph, a diaphragm, means exerting a pressure centrally of said diaphragm, whereby said diaphragm is placed under constant and direct tension and means
 45 transmitting sound vibrations to said diaphragm, said tensioning pressure being applied to said diaphragm in a direction opposite to the direction of movement of said sound vibrations in passing to said diaphragm.
 50

4. In a phonograph, a diaphragm, means exerting a pressure on said diaphragm whereby it is placed under constant direct tension, a reproducer point, and vibrator
 55 means extending from said point to said diaphragm whereby the sound vibrations resulting from the engagement of said point with indicated sound waves on a record will be transmitted from said point to said diaphragm through said vibrator means, said
 60 tensioning pressure being applied to said diaphragm in a direction opposite to the direction of movement of said sound vibrations in passing to said diaphragm.

65 5. In a phonograph, a record support,

means rotating the same, a sound box fixed relatively to said support and spaced away therefrom, a horizontally disposed diaphragm in said box, a vibrator member carrying a point adapted to engage and
 70 track in the indicated sound waves of a record, and extending in a direct line from said reproducer point to a point below said diaphragm, means forming a swivel connection between the end of said vibrator member and said diaphragm and means disposed
 75 out of the range of vibrations passing to said diaphragm, whereby said diaphragm and said connecting means are placed under tension.
 80

6. In a phonograph, a diaphragm, a flexible member carried thereby and adapted to transmit vibrations thereto, means exerting a pressure upon said diaphragm through
 85 said member, whereby said diaphragm is placed under constant direct tension, a reproducer point, and a vibrator member between said point and said flexible member, whereby the vibrations resulting from the engagement of the said point with indicated
 90 sound waves on a record will be transmitted from said point to said diaphragm through said vibrator member and said flexible member.

7. In a phonograph, a diaphragm, a flexible member carried thereby and adapted to transmit vibrations thereto, means exerting a pressure upon said diaphragm through
 95 said member, whereby said diaphragm is placed under constant direct tension, a reproducer point, a vibrator member between said point and said flexible member, whereby the vibrations resulting from the engagement of the said point with indicated sound
 100 waves on a record will be transmitted from said point to said diaphragm through said vibrator member and said flexible member, and means causing said point to press upon said record.
 105

8. In a phonograph, a diaphragm, a flexible member carried centrally thereof and adapted to transmit vibrations thereto, means tensioning said member, a reproducer point, a vibrator member between said point
 110 and in contact with said flexible member whereby the vibrations resulting from the engagement of the said point with the indicated sound waves on a record will be transmitted from said point to said diaphragm through said vibrator member and said flexible
 115 member, and an elastic member having one end secured to said vibrator member and the other end secured directly opposite said flexible member whereby said flexible member and said elastic member will have movement about a common axis.
 120

9. In a phonograph, a diaphragm, a flexible member carried thereby and adapted to transmit vibrations thereto, a reproducer point, a vibrator member between said point
 125

and said flexible member whereby the vibrations resulting from the engagement of the said point with indicated sound waves on a record will be transmitted from said point to said diaphragm through said vibrator member and said flexible member, and elastic members extending from a fixed point directly opposite said flexible member to said flexible member and to said vibrator member respectively, whereby said diaphragm will be tensioned, and said vibrator member will press said point upon said record, and said arm and said elastic members may rotate about a common axis.

10. In a phonograph, an amplifier, a flexible member attached thereto, means exerting a pressure upon said amplifier through said flexible member whereby said amplifier is placed under constant direct tension, means whereby the tension of said amplifier may be varied, and a vibrator member carrying a reproducer member attached to said flexible member.

11. In a phonograph, a diaphragm, means exerting a pressure on said diaphragm, whereby said diaphragm is placed under constant direct tension, means varying said pressure to regulate said tension, and means transmitting sound vibrations to said diaphragm, said tensioning pressure being applied to said diaphragm in a direction opposite to the direction of movement of sound vibrations in passing to said diaphragm.

12. In a phonograph, a diaphragm, means exerting a pressure centrally of said diaphragm whereby said diaphragm is placed under constant direct tension, means varying said pressure to regulate said tension, and means transmitting sound vibrations to said diaphragm, said tensioning pressure being applied to said diaphragm in a direction opposite to the direction of movement of sound vibrations in passing to said diaphragm.

13. In a phonograph, a diaphragm, an elastic tensioning member acting centrally of said diaphragm, whereby said diaphragm is placed under constant direct tension, means varying the tension of said elastic member to vary the tension of said diaphragm, and means transmitting vibrations to said diaphragm, said tensioning means being applied in a direction opposite to the direction of movement of sound vibrations in passing to said diaphragm.

14. In a phonograph, a diaphragm, an elastic tensioning member acting centrally of said diaphragm, whereby said diaphragm is placed under tension, means varying the tension of said elastic member to vary the tension of said diaphragm, means transmitting vibrations to said diaphragm, said tensioning means being applied in a direction opposite to the direction of movement of sound vibrations in passing to said dia-

phragm, and means preventing vibrations in said tensioning member.

15. In a phonograph, a diaphragm, a flexible member carried thereby and adapted to transmit vibrations thereto, a spring acting through said flexible member to tension said diaphragm, a damper acting upon said spring, and means transmitting vibrations to said diaphragm through said flexible member.

16. In a phonograph, a diaphragm, a headed stud passing through said diaphragm with the head engaging same, a flexible looped cord suspended from said stud, a reproducer point, a vibrator member, the opposite ends of which respectively carry said point and are adapted to be attached to said cord, whereby the vibrations resulting from the engagement of said point with indicated sound waves on a record will be transmitted from said point to said diaphragm through said vibrator member and said cord, means carried by said arm whereby it may be attached to said cord, a spring secured to the attachment means between said arm and said cord, and acting axially of the center of said diaphragm and means causing said point to press upon said record.

17. In a phonograph, the combination of a mandrel, and means rotating same, of a sound box fixed relatively to said mandrel and at a point substantially tangential thereto, and substantially midway between the ends thereof, a vibrator member having a swiveling relation to said sound box and its diaphragm, and carrying a reproducer point adapted to engage the indentations in a cylindrical record whereby said vibrator member will move longitudinally of said cylindrical record through its engagement with the indentations thereon, elastic means forcing said reproducer point into engagement with the record and elastic means below the swivel connection exerting a constant direct pressure upon the diaphragm in said sound box.

18. In a phonograph, a fixed sound box, a diaphragm therein, a vibrator member one end of which is attached to said diaphragm by a swivel connection, and the other end of which is provided with a reproducer point whereby intermediate pivotal connections on said member are avoided, means intermediate the ends of said member whereby said reproducer point is forced into intimate relation with the record and elastic means acting at the other end of said member whereby said diaphragm is placed under constant direct tension, and the oscillations of said member will be about an axis at the end thereof adjacent to the diaphragm.

19. In a phonograph, a diaphragm, a member attached thereto, means exerting pressure upon said diaphragm through said member, whereby said diaphragm is placed

under constant direct tension, and a vibrator member, one end of which carries a reproducing member and the other end of which is engaged with said first named member.

- 5 20. In a phonograph, a diaphragm, a member attached thereto, a vibrator member one end of which loosely engages said member and the other end of which carries a reproducing member, and means exerting constantly uniform pressure upon said vibrator
- 10

member whereby said diaphragm is tensioned through said vibrator member and said first named member.

In witness whereof I have hereunto affixed my signature, this 23d day of June, 1909, 15 in the presence of two witnesses.

CLINTON B. REPP.

Witnesses:

F. T. WENTWORTH,

P. FRANK SONNEK.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

1894

J. F. MEANS.
ELECTRIC BRAKE FOR GRAPHOPHONES.
APPLICATION FILED APR. 10, 1911.

1,004,059.

Patented Sept. 26, 1911.

2 SHEETS—SHEET 1.

FIG. 1

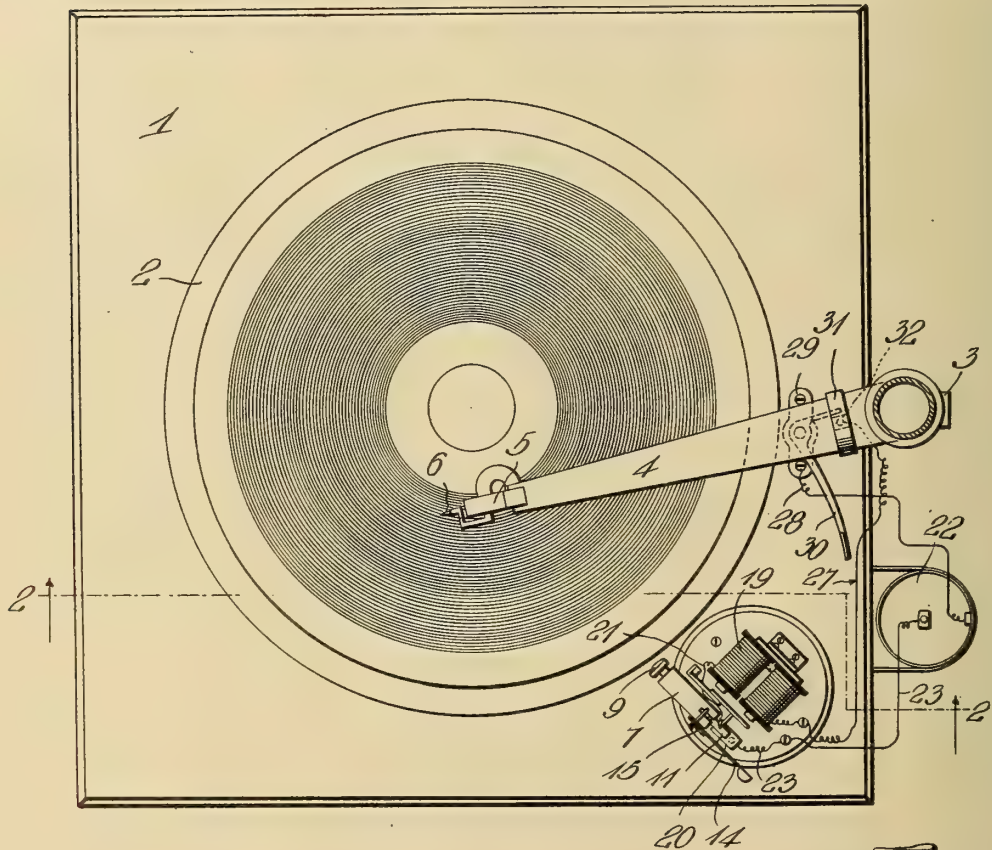
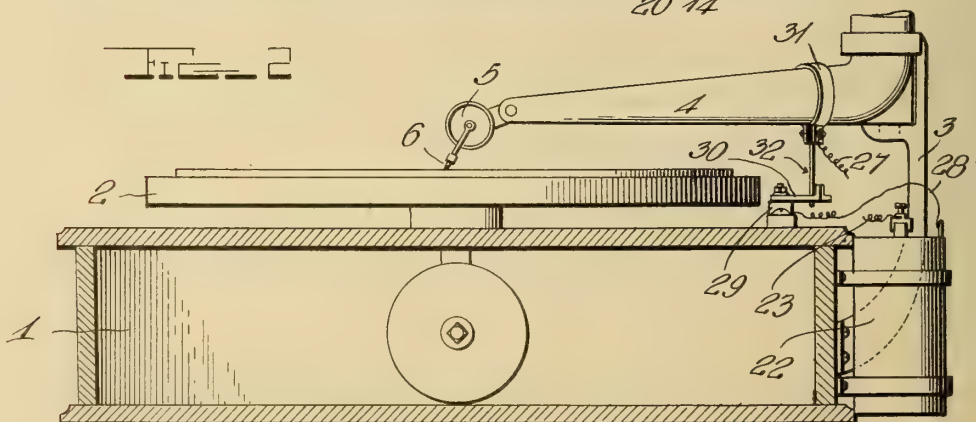


FIG. 2



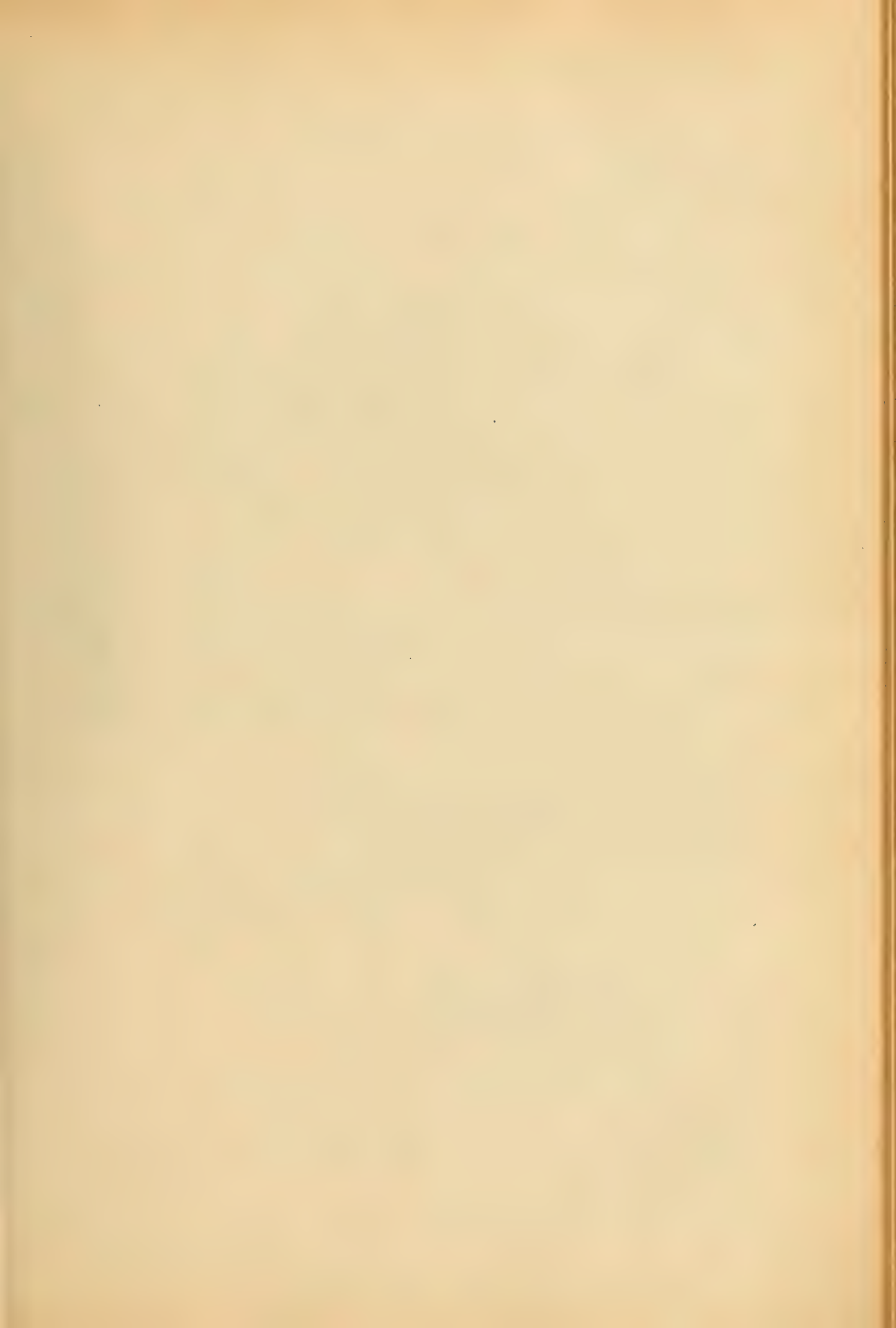
Inventor

Witnesses

E. C. Crampton
J. B. Hopkins

John F. Means

by *A. B. Wilson & Co*
Attorneys

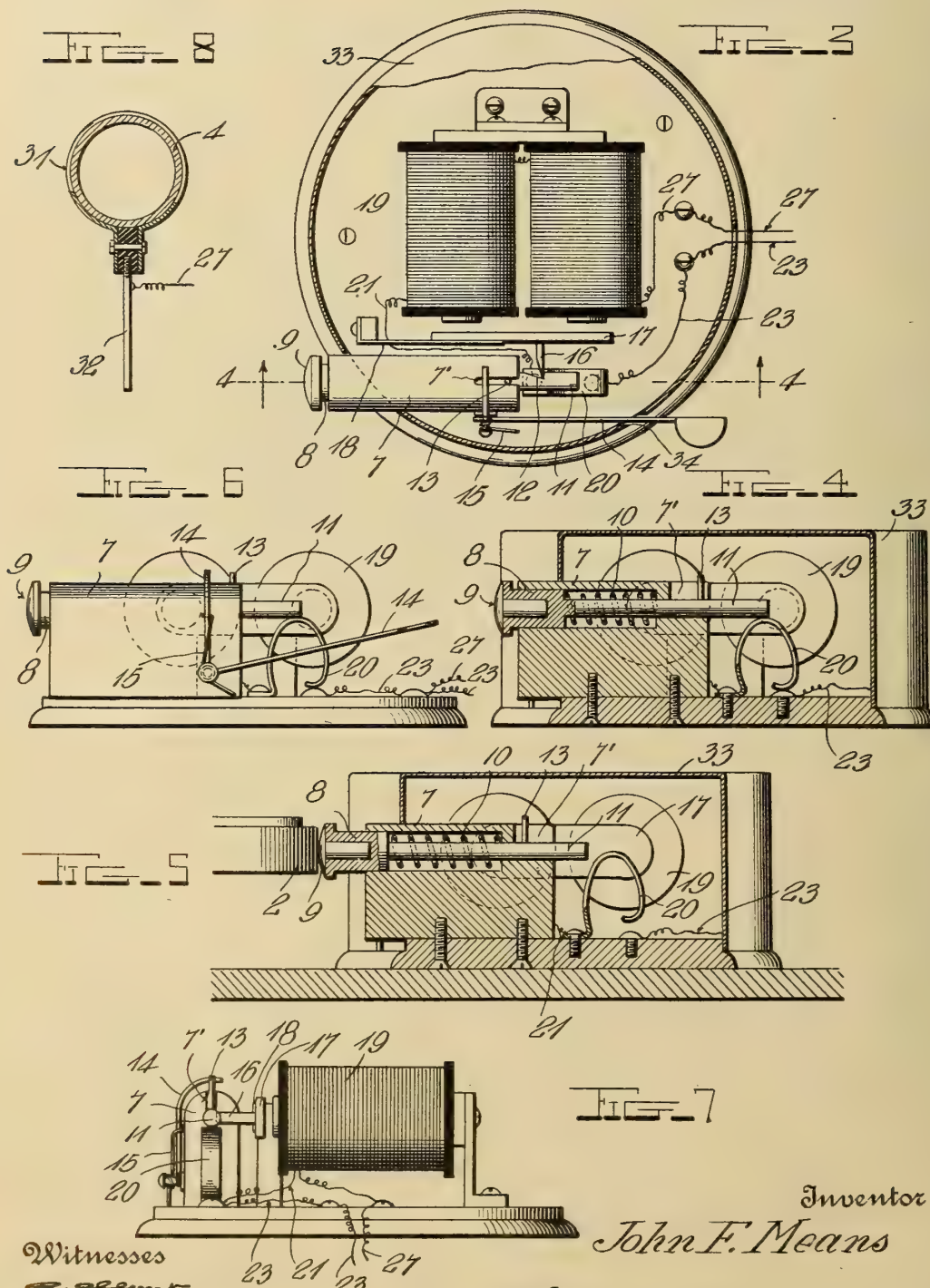


J. F. MEANS.
ELECTRIC BRAKE FOR GRAPHOPHONES.
APPLICATION FILED APR. 10, 1911.

1,004,059.

Patented Sept. 26, 1911.

2 SHEETS-SHEET 2.



Witnesses
E. Clement
O. B. Hopkins

Inventor
John F. Means
by A. B. Wilson & Co.
Attorneys

UNITED STATES PATENT OFFICE.

JOHN F. MEANS, OF OIL CITY, PENNSYLVANIA.

ELECTRIC BRAKE FOR GRAPHOPHONES.

1,004,059.

Specification of Letters Patent.

Patented Sept. 26, 1911.

Application filed April 10, 1911. Serial No. 620,054.

To all whom it may concern:

Be it known that I, JOHN F. MEANS, a citizen of the United States, residing at Oil City, in the county of Venango and State of Pennsylvania, have invented certain new and useful Improvements in Electric Brakes for Graphophones; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in electric brakes for graphophones.

The principal object of the invention is to provide an improved construction of electric brake mechanism for graphophones whereby the machine will be automatically stopped.

Another object is to provide means whereby the circuit closing mechanism of the electric brake releasing mechanism may be adjusted to operate the brake when the needle has reached any desired point on the record.

With these and other objects in view the invention consists of certain novel features of construction, combination and arrangement of parts as will be more fully described and particularly pointed out in the appended claim.

In the accompanying drawings: Figure 1 is a plan view of a disk graphophone showing the application of this invention; Fig. 2 is a vertical section taken on the line 2—2 of Fig. 1; Fig. 3 is a plan view partly in section on an enlarged scale, of the magnet and brake releasing mechanism; Fig. 4 is a vertical section taken on line 4—4 of Fig. 3 with the parts in retracted position; Fig. 5 is a similar view with the brake in operative position; Fig. 6 is a front elevation with the casing removed; Fig. 7 is an end elevation thereof; Fig. 8 is a detail cross sectional view through the horn showing the mounting of the contact carried thereby.

In the embodiment illustrated, a cabinet 1 is shown in which is arranged the motor and operating mechanism of the graphophone. Above the cabinet and revolvably mounted thereon is a turn table 2 on which the record disks are arranged and operated. A horn supporting bracket 3 is preferably secured to one side of the cabinet and a sound transmitting horn 4 is pivotally

mounted in the upper end of said bracket. This horn 4 carries the reproducer 5 having a record engaging needle 6.

The parts above described may be of the usual or any desired construction and form no part of the present invention.

This improved brake mechanism comprises a brake cylinder 7 mounted in any suitable position on the cabinet adjacent to the edge of the turn table 2. A brake piston or plunger 8 is slidably mounted in the cylinder 7 carrying at its outer end a brake shoe 9 which is adapted to be forced into engagement with the edge of the turn table for the purpose of stopping said table. This plunger or piston 8 is projected and held in operative position by a coiled spring 10 arranged around the rod or stem 11 of the piston within the casing as is shown clearly in Fig. 1. The outer end of the rod or stem 11 extends through and projects beyond the end of the cylinder 7 and has a notch 12 formed therein which when the plunger is in a retracted or inoperative position is adapted to be engaged by a suitable catch which holds the plunger in inoperative position. A pin 13 preferably extends at right angles from the stem 11 and projects through a longitudinally extending slot 7' in the cylinder 7 the wall at the front end of the slot serving to limit the forward movement of the plunger and the engagement of the pin 13 with the side walls of the slot prevents rotation of the plunger. This pin 13 in connection with a lever 14 operates to retract the plunger when desired. This lever 14 is preferably in the form of a bell-crank fulcrumed to the cylinder 7 with one arm extended in position to engage the pin 13 when the other arm thereof is depressed. A spring 15 is mounted on the pintle of and engages the lever 14 to throw said lever back out of the way to permit the plunger to move forward without interruption when the stem thereof has been released and further forming a yielding stop for the pin when the rod is released, as will be hereinafter more fully described.

The catch herein shown for holding the plunger 8 in retracted position comprises a finger 16 which projects at right angles from an armature 17 which is held in place by a spring 18 in position to be operated

by an electromagnet 19 which is arranged on top of the cabinet adjacent the cylinder 7.

On the cabinet adjacent the outer end of the plunger rod 11 is a circuit breaker 20, one member of which is in electrical connection with one pole of the magnet 19 by a suitable conducting wire 21 while the other member of said circuit is in electrical connection with a suitable battery 22 by a circuit conducting wire 23. The battery 22 may be arranged in any suitable position but is shown secured to the side of the cabinet 1. With the other pole of the magnet is connected a current conducting wire 27 which runs to a contact switch herein-after described. The other terminal of said switch is connected to the battery 22 by a current conducting wire 28. When the brake plunger rod 11 is retracted to an inoperative position and the notch 12 thereof engaged by the stop finger 16, the outer end of said plunger will engage the circuit breaker and close it.

The magnet 19 and the brake mechanism are inclosed in a suitable protective casing 33 having an opening 34 in one wall thereof through which the end of the lever 14 projects in position to be depressed by the operator for withdrawing the brake into inoperative position.

The circuit closing switch for the electromagnet as here shown preferably consists of a bracket 29, secured to the top of the cabinet 1 on which is fulcrumed a bell crank lever 30, the terminal of the current conducting wire 28 being connected with said bracket 29. The other terminal of the switch is in the form of a metal band 31 which encircles the horn 4 and has a contact point 32 secured between the ends of said band 31 and with which is connected the terminal of the current conducting wire 27 of the electromagnet. This contact 32 is insulated from the band and projects into the path of one arm of the bell crank 30 which when it is desired to stop the machine will be swung into engagement with said contact 32 thereby completing the circuit to the electromagnet and energizing said magnet, causing it to retract the armature 17, and disengage the finger 16 thereof from the notch 12 in the brake plunger rod, releasing said rod and permitting the spring 10 to force the brake shoe 9 into engagement with the turn table thereby stopping said table. When the plunger is thus projected,

the outer end of the plunger rod 11 will be disengaged from the circuit breaker, allowing the members thereof to again break the circuit to the magnet.

By the use of this improved brake and switch mechanism, it will be readily seen that the machine may be stopped at any desired place on the record.

While the brake and its operating mechanism has been herein shown as applied to a disk record machine, it will be understood that this application is simply shown for illustrative purposes as the switch may be readily applied to a cylinder machine and the brake mechanism thereon arranged to engage the record, mandrel or other moving part of the machine whereby the machine will be stopped.

From the foregoing description, taken in connection with the accompanying drawings, the construction and operation of the invention will be readily understood without requiring a more extended explanation.

Various changes in the form, proportion and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of the invention as defined in the appended claim.

I claim as my invention:

A structure of the class described comprising a cabinet having a revoluble member thereon, a brake cylinder secured to said cabinet, a spring actuated plunger mounted in said cylinder and having a brake shoe adapted to contact with said revoluble member when in projected position, a projection on said plunger projecting through and guided by a slot in the brake cylinder, a bell crank lever arranged to engage said projection above the latter for retracting said plunger, a spring for normally holding said lever out of the path of said projection and forming a yielding stop for the latter when released, an armature arranged adjacent said brake cylinder and having a laterally extending finger for engagement with said plunger, magnets for actuating said armature, and a source of energy for energizing said magnets.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JOHN F. MEANS.

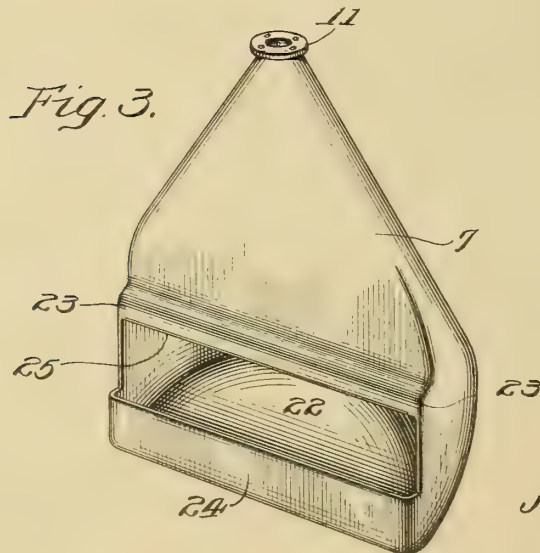
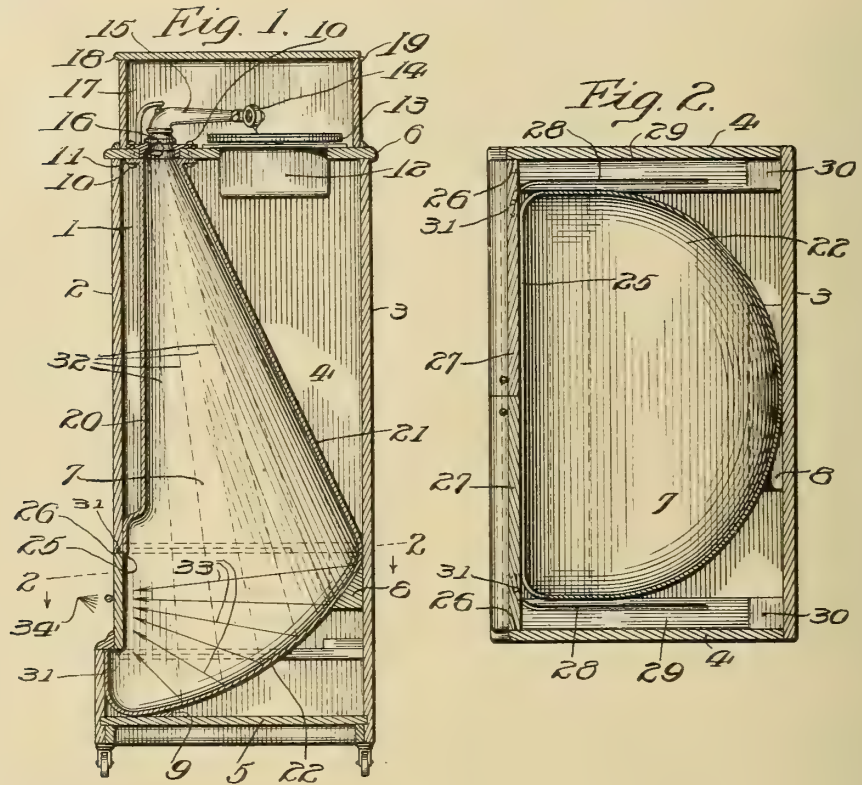
Witnesses:

ABEL L. CONFER,
LOUIS H. KISTLER.

A. HEWITT.
SOUND AMPLIFIER.
APPLICATION FILED APR. 14, 1908.

1,004,256.

Patented Sept. 26, 1911.



WITNESSES
F. J. Hartman.
Frederick A. Blount

BY

INVENTOR
Albertus Hewitt.

Stone & Co.

ATTORNEY

UNITED STATES PATENT OFFICE.

ALBERTIS HEWITT, OF CAMDEN, NEW JERSEY, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

SOUND-AMPLIFIER.

1,004,256.

Specification of Letters Patent.

Patented Sept. 26, 1911.

Application filed April 14, 1908. Serial No. 426,954.

To all whom it may concern:

Be it known that I, ALBERTIS HEWITT, a citizen of the United States, and a resident of the city of Camden, State of New Jersey, have invented certain new and useful Improvements in Sound-Amplifiers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to sound amplifiers in general and more specifically to those used in talking machines.

The principal object of my invention is to provide a sound amplifier by which the audibility of sound is increased and at the same time preserving its purity of tone and keeping it free from extraneous noises.

A further object of my invention is to provide a sound amplifier in which sound waves passing therethrough are first amplified and then concentrated at a predetermined position or line of concentration.

A further object of my invention is to provide a sound amplifier which also has concentrating means and which may be readily inclosed in a talking machine cabinet or casing.

A further object of my invention is to provide a sound amplifier constructed of a rigid and substantially non-vibratory material, thus permitting the sound waves to pass therethrough without being mingled with sound waves heretofore caused by vibrations of the casing of sound amplifiers previously used.

In my improved sound amplifier I have also provided means whereby the sounds emitted are best audible at the line of concentration and elsewhere equally audible at points of equal radial distance from the mouth of the sound amplifier within the area extending in front of the plane of the mouth of the horn.

With these objects in view, together with other objects which will appear in the following specification, my invention consists in the construction, combination and arrangement of parts, such as will be herein after pointed out in the claims made hereafter.

Heretofore sound amplifiers used in connection with the reproduction of sounds by talking machines have been horns, conical or pyramidal in shape, the smaller end be-

ing connected to a sound conveying tube which is attached to the sound box of the talking machine, and the sound waves reproduced by the sound box, passing through the said tube into the horn, issue therefrom at its larger and flaring end in their amplified form. It will, therefore, be apparent that when the sound waves issue from the flaring mouth of the horn they are divergent, and are thus diffused into the surrounding atmosphere.

In my improved amplifier I have provided means whereby sound waves passing therethrough are first amplified and then concentrated at a predetermined position or line of concentration and when such predetermined position is without the sound amplifier, instead of the sound waves issuing from the mouth of the horn in divergent directions they converge as amplified, at the certain position or line of concentration. In this manner I have provided means for greatly increasing the audibility of the sounds passing through a sound amplifier and have also provided means whereby the position or line of concentration may be fixed as desired.

Referring to the accompanying drawings in which similar reference characters indicate like parts in the several figures, Figure 1 is a vertical sectional view of my sound amplifier and a suitable inclosing cabinet; Fig. 2 a horizontal section of my improved sound amplifier and the inclosing cabinet taken on the line 2-2 of Fig. 1; and Fig. 3 is a perspective view of my invention.

1 is a rectangular casing or cabinet having a front 2, back 3, sides 4-4, bottom 5 and top 6. Mounted within the cabinet is my improved sound amplifier 7 which is held rigid therein by the supporting blocks 8 and 9 and by the bolts 10 which are adapted to engage and firmly hold the top 11 of the sound amplifier 7 against the top 6. Supported by the top 6 is a motor casing 12 inclosing a suitable motor upon the spindle of which is mounted a turntable 13. Sound reproducing means are provided by the sound box 14 in which is suitably mounted a stylus, the vibrations of which correspond to the sound waves recorded on the surface of the sound record carried by the turntable 13; connected to the sound box 14 is the sound conveying tube 15 which conveys the sound waves reproduced by the sound box.

The downwardly extending elbow portion of the sound conveying tube 15 is suitably pivoted to the top 6 and is connected with the sound amplifier 7 through a hole 16 suitably provided in the top 6. Mounted upon the top 6 of the cabinet is a casing 17 inclosing the turntable 13 and the reproducing parts of the talking machine. The top 18 of the casing 17 is hinged at 19 thereby permitting easy access to the reproducing parts heretofore mentioned.

Means are provided for concentrating the amplified sound, such means being of course capable of various embodiments. In certain constructions, it is desirable to deflect the amplified sound before or during concentration. Means are provided, therefore, for this purpose, and in the particular embodiment which I have selected to illustrate my invention and which is shown in the accompanying drawings, the amplifier 7 has a front wall 20, side and rear walls 21 and a deflecting surface 22 which is joined or made integral with the rear wall 21 at any desired angle, although it is to be understood that the deflecting surface is not necessarily joined or made integral with the amplifier, but may in certain constructions be separated therefrom. The front wall 20 has an offset 23 in close contact with the inner surface of the front 2 and the deflecting surface 22 terminates in an upwardly extending portion or lip 24, which is also in close contact with the inner surface of the front 2.

As shown in Fig. 1 the mouth 25 of the sound amplifier substantially coincides with the opening 26 of the cabinet 1 and doors 27 are provided by which the opening 26 and at the same time the mouth 25 may be closed. I have shown a convenient and useful manner of mounting the doors 27 whereby they may be completely opened or closed or occupy any intermediate position. I accomplish this by providing tracks 28 placed within the recesses 29 one on either side of the opening 26, each adapted to receive the adjacent door, the inward movement of which is determined by stop blocks 30. Upon the doors 27 are mounted pins 31 adapted to ride within and be guided by the tracks 28. When the mouth 25 is opened by sliding the doors 27 the sounds issuing from the mouth may be deflected by arranging the doors in any desired position.

Indicated by dotted lines 32 are sound waves passing through the sound amplifier from the sound conveying tube. As these sound waves strike the deflecting surface 22 they are deflected at angles which may be predetermined. The deflecting surface 22 may be constructed so that the deflected sound waves 33 will all pass through the mouth of the sound amplifier and the opening 26 of its cabinet in certain lines of direction which ultimately meet in a point 34 or

a series of points forming a line. I term this line the line of concentration. It is obvious that by altering the deflecting surface 22 and the angle at which it is mounted the line of concentration may be determined as desired, either within or without the sound amplifier.

To prevent the mingling with the amplified sounds of secondary sounds caused by vibrations of the casing of the sound amplifier, I construct the casing of the sound amplifier of plaster-of-Paris, cement or some other suitable like material which is rigid and substantially inelastic and non-vibratory and I have also found it desirable to make the interior of the casing smooth.

In the accompanying drawings and in the foregoing description I have shown the application of my improved sound amplifier in an inclosing talking machine, cabinet or casing and connected to the reproducing parts of a talking machine, but do not limit myself to its use in that connection alone for it is obvious that it can be used in the ordinary talking machine with the sound amplifier mounted upon a suitable bracket or otherwise and extending upwardly and that it also can be used in any connection, the purpose of which is to amplify sounds.

Various changes could be made in the details of the construction, combination and arrangement of my improved sound amplifier illustrated, without departing from the spirit and scope of my invention.

Having thus fully described my invention, I claim and desire to protect by Letters Patent of the United States:—

1. A sound amplifying horn having its outer end closed and provided with a lateral outlet, and having a focusing surface, arranged to directly reflect all waves convergingly through said outlet toward a line.

2. A sound amplifying horn provided with means for concentrating the sound waves substantially along a line.

3. A sound amplifying horn comprising a conical portion and provided with a restricted outlet in one side thereof, and means closing the end of said conical portion for directly reflecting all of the sound waves through said outlet in planes converging toward a common line.

4. A sound amplifying horn comprising a conical portion and provided with an outlet on one side thereof, and means closing the end of said conical portion for reflecting the sound waves through said outlet and concentrating the same in planes meeting in a line.

5. A sound amplifying horn comprising a conical portion and provided with an outlet in one side thereof, and means closing the end of said conical portion for reflecting the sound waves through said outlet and concentrating the same along a transverse line.

6. A sound amplifying horn comprising a flat conical portion having a closed outer end and provided with an outlet on its flat side adjacent to said end, said end being so
5 constructed as to reflect the sound waves through said opening and concentrate the same in a line.

7. A sound amplifier comprising a horn provided with a lateral opening in one side
10 thereof and formed of a substantially non-vibratory material, arranged to direct all sound waves through said opening and convergently toward a line.

8. A sound amplifier comprising a horn
15 provided with a lateral opening in one side thereof and formed of a substantially inelastic material, arranged to direct all sound waves through said opening and convergently toward a line.

20 9. A sound amplifier having a lateral outlet, and provided with a cylindrically curved end closure arranged to reflect sound waves

through said outlet and concentrate said waves to meet in a transverse line.

10. A sound amplifier having a substan- 25
tially D-shaped cross section increasing toward its outlet end, and having a lateral outlet adjacent to said end and provided with a curved closure extending across said
end arranged to reflect sound waves through 30
said outlet and concentrate them along a transverse focal line.

11. A sound amplifier, having a lateral outlet registerable with a cabinet aperture and provided with a rigid end closure ar- 35
ranged to reflect sound waves through said outlet and concentrate said waves to meet in a line.

In witness whereof I have hereunto set my hand this 13th day of April, A. D. 1908. 40

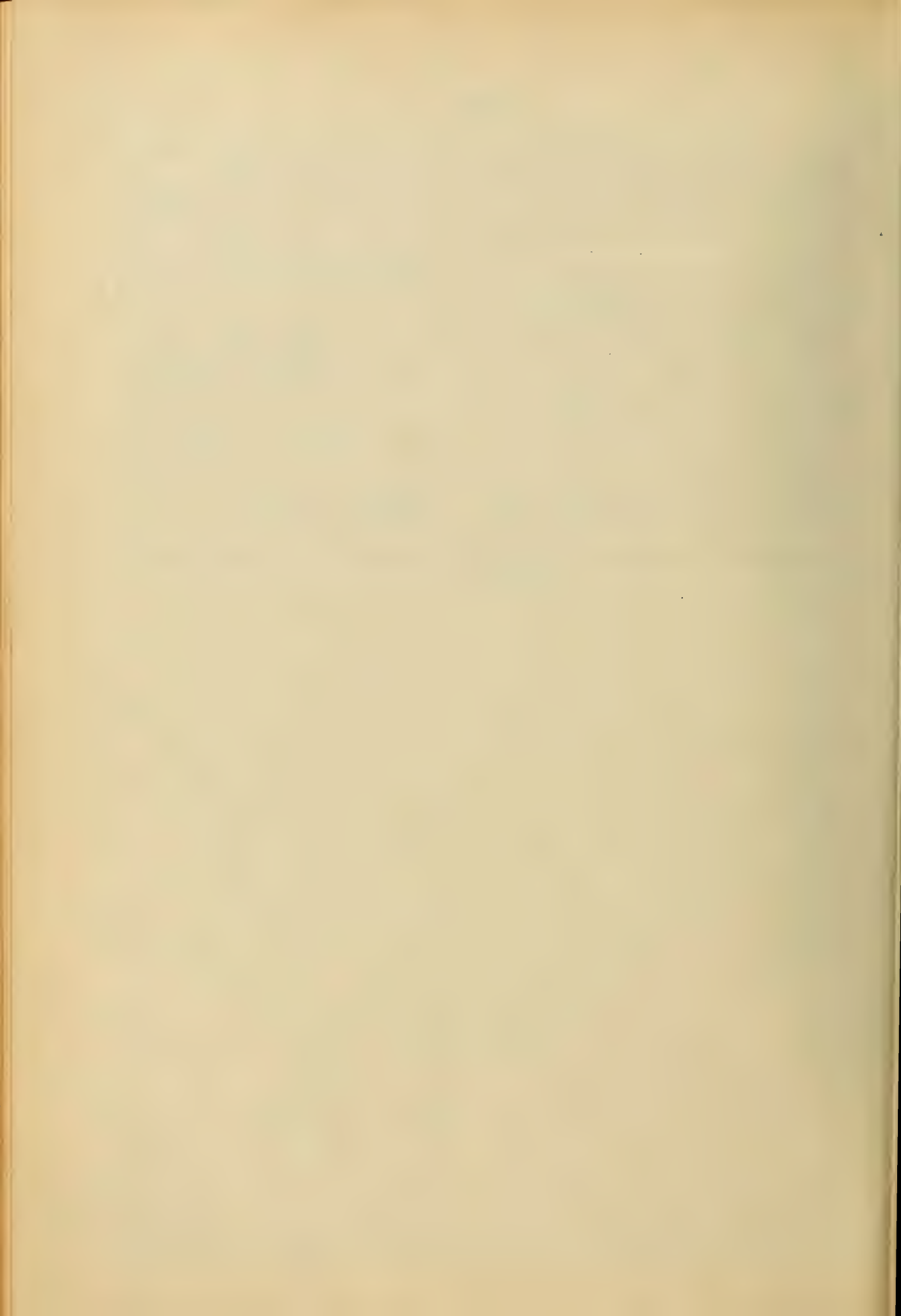
ALBERTIS HEWITT.

Witnesses:

FREDK. C. EBERHARDT,

FREDERICK A. BLOUNT.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,
Washington, D. C."



J. H. J. HAINES.
 PHONOGRAPH.
 APPLICATION FILED DEC. 23, 1908.

1,005,025.

Patented Oct. 3, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

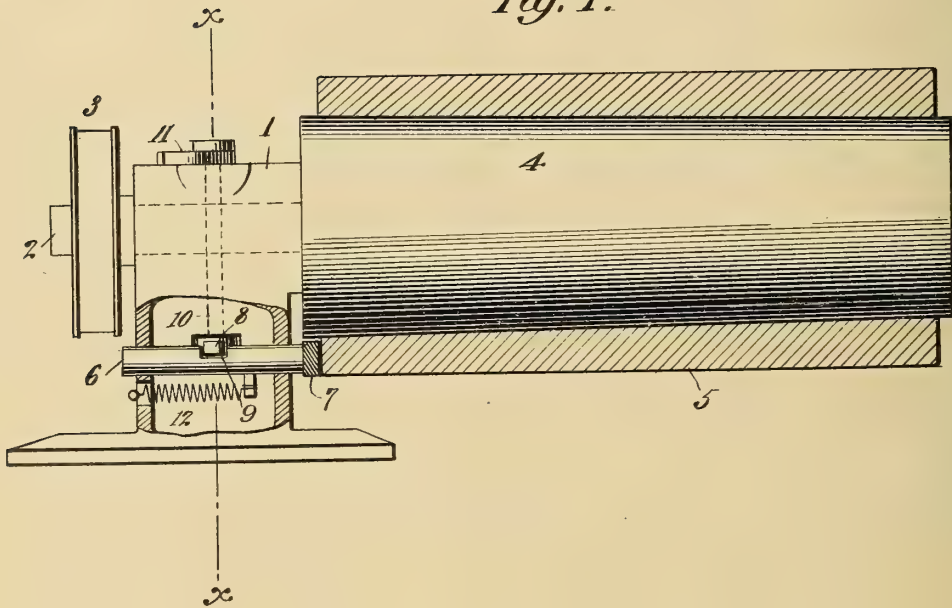


Fig. 2.

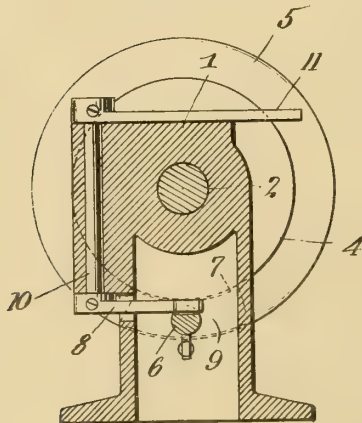


Fig. 3.

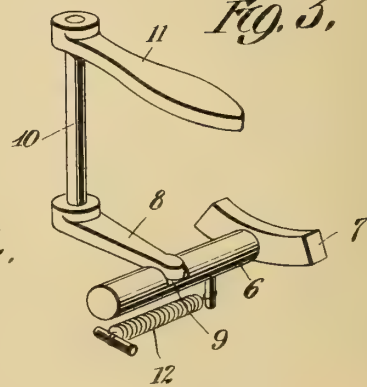
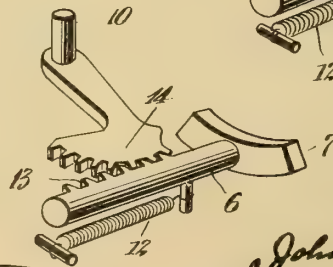
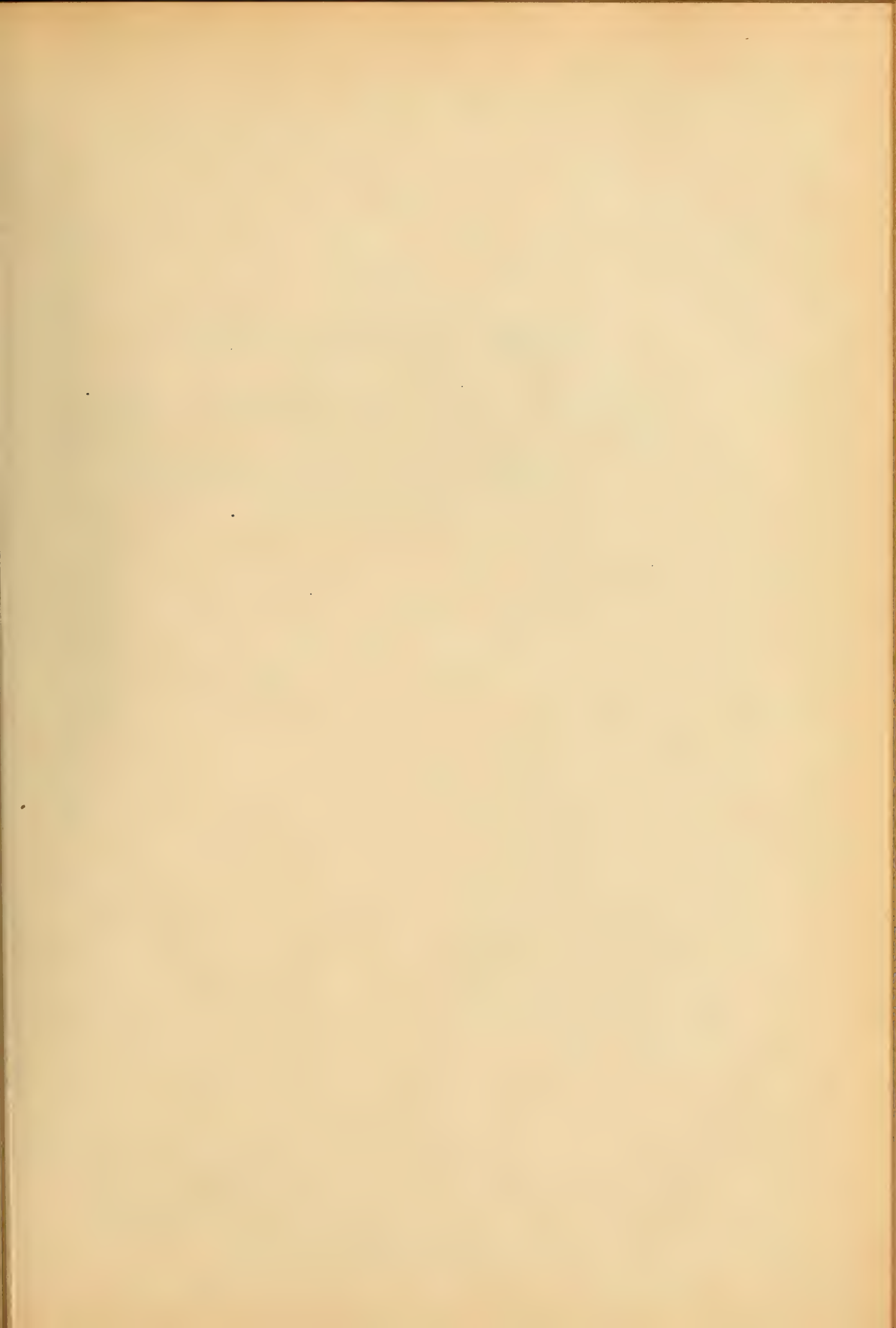


Fig. 4.



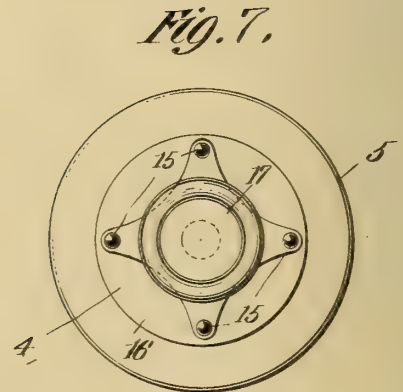
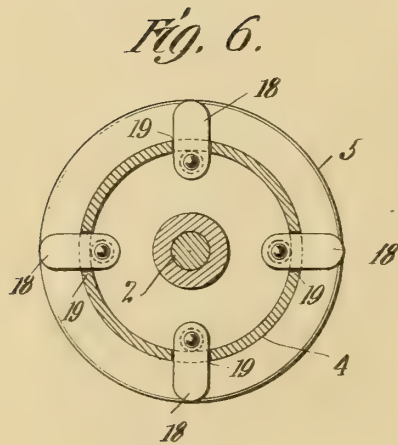
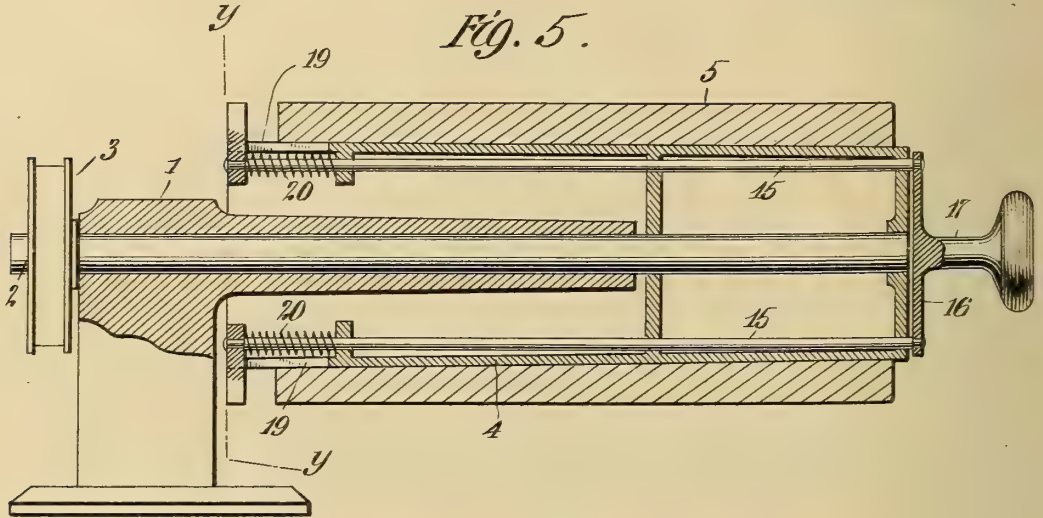
Witnesses:
Francis Ober
Waldo M. Chapin

Inventor
John H. J. Haines
 By *his Attorneys*
Rambaum & Stockbridge



1,005,025.

Patented Oct. 3, 1911.
 2 SHEETS—SHEET 2.



Witnesses:
Franz Ober
Waldo M. Chapin

Inventor
John H. J. Haines
 By *his Attorneys*
Rosenbaum & Co.

UNITED STATES PATENT OFFICE.

JOHN H. J. HAINES, OF NEW YORK, N. Y.

PHONOGRAPH.

1,005,025.

Specification of Letters Patent.

Patented Oct. 3, 1911.

Application filed December 23, 1908. Serial No. 468,892.

To all whom it may concern:

Be it known that I, JOHN H. J. HAINES, a citizen of the United States, residing at the city of New York, in the borough of Manhattan and State of New York, have invented certain new and useful Improvements in Phonographs, of which the following is a full, clear, and exact description.

This invention relates to phonographs and allied machines and has for its object to facilitate the removal of the record tablet from the machine and avoid injury of the same in that operation.

The invention relates particularly to machines using a record tablet of the cylinder type. These cylinders are applied to the machine by passing them over a slightly coned drum or mandrel on which they are held by friction. In order to remove the cylinder from the machine, it has heretofore been necessary to grasp the cylinder between the fingers and exert sufficient force to overcome its frictional engagement with the drum. This is an unhandy method of manipulation and often results in damage to the record surface by reason of the pressure of the fingers thereon, or by transference of dust or dirt from the fingers to the record. Also, if the record sticks tightly upon the drum, the force used in removing it sometimes causes it to suddenly relax and the cylinder falls from the hand and is broken.

To avoid these disadvantages and such others as often occur in the removal of the cylinder from the machine, is the object of my invention, which consists in providing the machine with what I have termed a "throw-off" or ejector comprising a pusher mounted in the frame of the machine in a position where it can be brought to bear against the inner end of the record cylinder in a direction parallel to the axis of the cylinder, and a manually operated handle or lever connected therewith in such a manner that by manipulating the handle or lever, the pusher may be thrust against the end of the record cylinder to force it from its supporting drum or mandrel. The movement of the record cylinder under the action of the pusher is preferably only sufficient to release it from its frictional engagement with the drum or mandrel, so that it can be readily removed by hand and without the exercise of force.

The invention is applicable to shaving machines, commonly used for turning off the

surface of a record cylinder and preparing it to receive a new record, since these machines comprise a drum or mandrel upon which the record cylinder is held in substantially the same manner as it is in the phonograph itself.

The invention is illustrated in the accompanying drawings, in which:

Figure 1 is a side elevation partially in section, of a portion of a phonograph or shaving machine upon which the record cylinder is mounted; Fig. 2 is a section on line $x-x$ of Fig. 1; Fig. 3 is a perspective view of the specific device comprising the invention; Fig. 4 is a similar view of a modification thereof; Fig. 5 is a view similar to Fig. 1, showing an alternative form of the invention; Fig. 6 is a section on line $y-y$ of Fig. 5, and Fig. 7 is an end elevation of the structure of Fig. 5.

1 indicates a portion of the frame of a phonograph or record shaving machine, in which is mounted a rotary shaft 2 having a driving pulley 3 and carrying the usual coned drum or mandrel 4 upon which the record 5 in the form of a cylinder is supported while in use. The record cylinder is coned interiorly to fit the surface of mandrel 4, so that when it is adjusted upon the mandrel and forced thereon slightly, it is held frictionally from independent movement with respect to the mandrel.

Mounted in a suitable part of the frame so as to slide therein is a rod or pusher 6 having a head 7 arranged at a point closely adjacent to the inner end of the record cylinder when it is properly adjusted upon the mandrel. This pusher has a longitudinal movement substantially parallel to the axis of the mandrel and cylinder and is adapted to be forced against the end of the cylinder to overcome the frictional engagement between it and the mandrel. In order to accomplish this movement, there is provided a crank arm 8 whose outer end stands in a notch 9 in the pusher 6 while the other end is secured to shaft 10 mounted in a suitable bearing in the frame 1, and which is equipped at its other end with a handle or lever 11 in convenient reach of the operator. I also provide a spring 12 secured at one end to the frame and at the other end to the pusher 6, the function of which is to return the pusher after it has been moved in one direction by the hand lever. It is now obvious that when it is desired to release the

record cylinder from the conical mandrel, it is only necessary to swing the lever 11 to the right, which drives the head of the pusher against the end of the cylinder and forces it sufficiently to the right to overcome its frictional engagement with the mandrel, whereupon by passing the fingers into the right hand end of the cylinder in the customary manner, the record is removed from the machine without having touched any portion of its outer surface. As soon as the hand lever is released, it moves back to its normal position together with the pusher under the action of the spring 12. Obviously, however, the spring is not an essential part of the invention, since the hand lever and pusher might be left in the position to the right and be returned to the normal position by the impact of the end of the record when another one is adjusted to the mandrel.

As a modification of the manner of communicating movement to the pusher rod from the handle, I have shown in Fig. 4 that the rod may be provided with a rack 13 and the crank 8 provided with a gear segment 14. This will give a more uniform application of pressure upon the pusher when it is manipulated and can be made to increase the length of the thrust of the pusher if that is found to be desirable.

The alternative form shown in Figs. 5 to 7, inclusive, comprises a number of rods 15 arranged longitudinally inside of the mandrel near to its walls and mounted in suitable bearings so as to slide in a direction parallel to the axis of the mandrel. At the outer or right hand end of the mandrel these rods are all connected together by a common cross-head 16, which is provided with a knob or handle 17 by which all of the rods can be together pulled outward. At the inner or left hand end of the rods they are each equipped with a pusher head 18 which extends radially outward through slots 19 in the wall of the mandrel and leading backward any suitable distance beyond the inner end of the record cylinder when it is properly adjusted to the mandrel. Between the pusher heads 18 and one of the bearings of the rods 15, springs 20 are interposed for returning the pusher heads to their normal position after they have been operated manually to release the record cylinder from the mandrel. The operation of this alternative construction obviously is that by pulling on the knob 17 the pusher heads 18 are

driven against the end of the record cylinder and thereby forced from its frictional engagement with the mandrel, the pusher heads meanwhile sliding through the slots in the wall of the mandrel. On the release of the knob the springs carry the pushers back to their normal position. This construction possesses an advantage over the construction first described in that it is adapted for different lengths of record cylinders, or to record cylinders which occupy various positions along the length of the mandrel. By making the slots of sufficient length, any movement of the pusher heads that may be necessary to reach and move the record cylinder may thus be provided for.

Having described my invention, I claim:—

1. In a phonographic machine, the combination of a recessed conical holder for the record tablet, said holder having a longitudinally extending slot therein at the larger end thereof, with means for pulling the record longitudinally over said holder, said means comprising a structure adapted to be placed under tension and movable through the recess of said holder, said structure having an angularly disposed part movable through said slot and adapted for engagement with the end of the record tablet which is carried by the larger end of the holder, said structure further comprising a handle at its outer extremity, whereby it may be placed under tension.

2. In a phonographic machine, the combination of a recessed conical holder for the record tablet, said holder having a longitudinally extending slot therein at the larger end thereof, with pulling means for shifting the record longitudinally over said holder, and means for guiding said pulling means, said pulling means comprising a structure adapted to be placed under tension and guidedly movable through the recess of said holder, said structure having an angularly disposed part movable through said slot and adapted for engagement with the end of the record tablet which is carried by the larger end of the holder, said structure further comprising a handle at its outer extremity.

In witness whereof, I subscribe my signature, in the presence of two witnesses.

JOHN H. J. HAINES.

Witnesses:

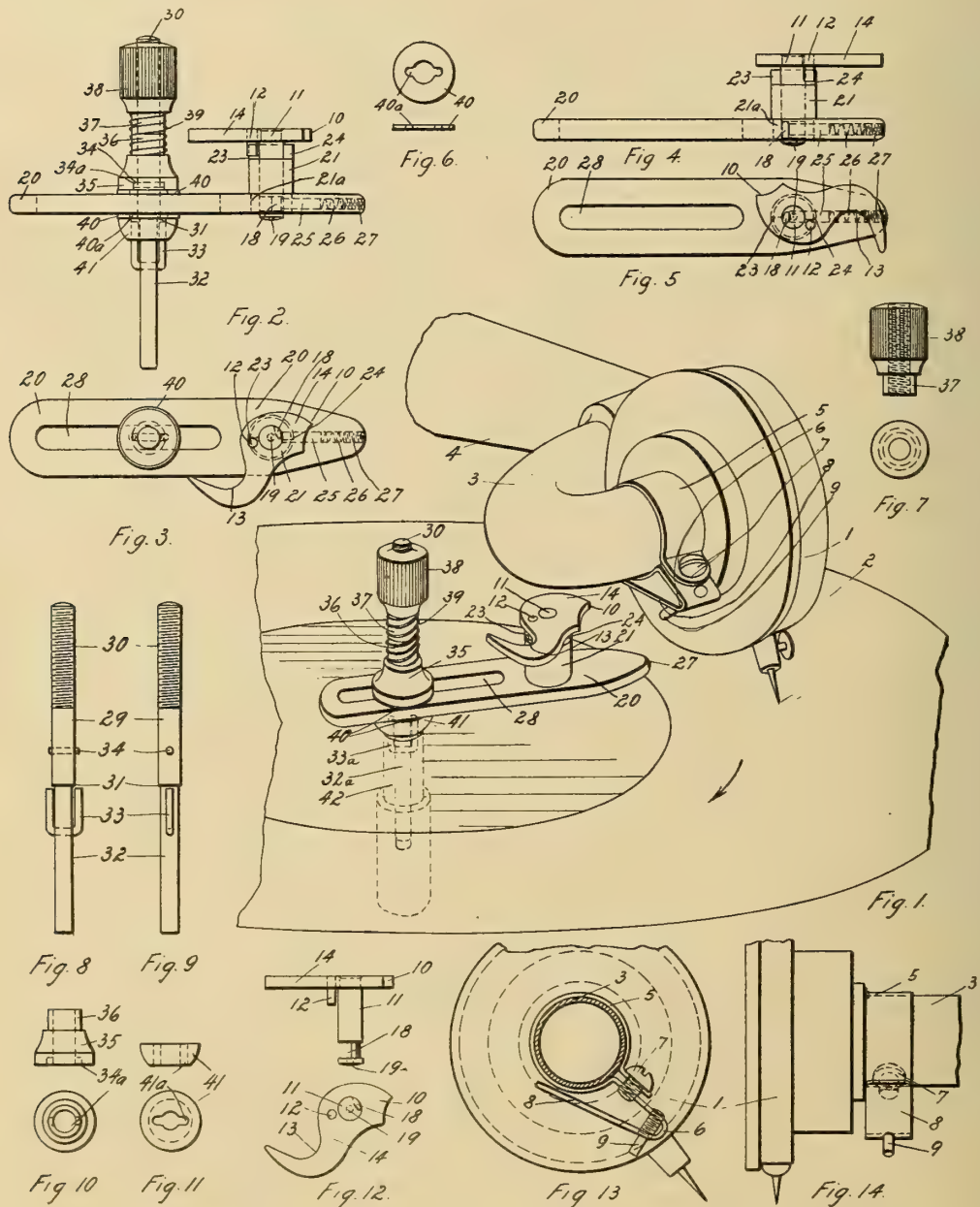
WALDO M. CHAPIN,
JAMES D. ANTONIO.

1,005,517

W. G. ALTENBURGH.
AUTOMATIC CUT-OFF AND STOP FOR SOUND REPRODUCING MACHINES.
APPLICATION FILED MAY 3, 1909.

1,006,517.

Patented Oct. 24, 1911.



WITNESSES:

Ad. Beyer
Belle F. Altenburgh

INVENTOR,

Wilford G. Altenburgh

UNITED STATES PATENT OFFICE.

WILFORD G. ALTENBURGH, OF NATIONAL CITY, CALIFORNIA.

AUTOMATIC CUT-OFF AND STOP FOR SOUND-REPRODUCING MACHINES.

1,006,517.

Specification of Letters Patent.

Patented Oct. 24, 1911.

Application filed May 3, 1909. Serial No. 493,755.

To all whom it may concern:

Be it known that I, WILFORD G. ALTENBURGH, a citizen of the United States, residing at National City, in the county of San Diego and State of California, have invented certain new and useful Improvements in Automatic Cut-Offs and Stops for Sound-Reproducing Machines, of which the following is a specification.

10 My invention relates to an improved automatic cutoff and stop for sound reproducing machines and is more particularly adapted to machines using the disk record.

15 The objects are: to provide a simple, cheap, safe, and positive means for automatically raising the needle and stopping the machine at the end of the record, or at any predetermined point when desired. Further, it is adjustable to different records and it is adaptable to the different makes of machines now in use and may be used therewith.

20 The uses and advantages of my invention will be readily apparent from the following description, reference being had to the accompanying drawings, in which:—

25 Figure 1 is a partial perspective view of a sound reproducing mechanism and showing my automatic cutoff and stop complete as used therewith: Fig. 2 is an elevational view of part of my device assembled: Fig. 3 is a top view thereof: Fig. 4 is a side elevation partially disassembled: Fig. 5 is a top view thereof: Fig. 6 is a plan and side elevation of a leather washer 40: Fig. 7 is a side and plan view of thumb nut 38: Figs. 8 and 9 are side views of spindle 32,—the one transverse to the other: Fig. 10 is a side and plan view of the upper arm clamp 35: Fig. 11 is a side and plan view of the lower arm clamp 41: Fig. 12 is a side and plan view of a catch device: Fig. 13 is a side view of a sound box with its needle and showing my cutoff and stop clamp thereon and Fig. 14 is a transverse elevational view thereof.

Similar characters of reference refer to similar parts throughout the several views.

30 My device is composed of two assembled parts, one of which is attached to the central vertical post of the machine, while the other is attached to the sound tube of said machine.

1 represents the sound box with the needle, 2 a disk record, 3 a sound tube and 4 a portion of a horn, all of which are of the ordinary style.

Around the sound tube 3 and adjacent to the sound box 1 is placed a clamp 5 adapted to be clamped tightly thereon by means of screw 7. One portion of said clamp is extended and formed into a short turn at 6 then backward under said sound tube 3, thus producing an inclined tongue 8 adjacent to said bend 6. Screwed into both members and extending downward, is stop pin 9.

60 In the central vertical post 42 of the machine, I have provided a central hole and near its top have extended the sides of said hole so as to fit the spindle 32 and pin 33 therein. This keeps the spindle 32 from turning after its insertion into said vertical post 42. Over spindle 32 and pin 33 is placed an arm clamp 41 shaped as shown at 41^a, to fit the pin 33, and it sets against the shoulder 31 of the spindle 32 and rests upon the top of the central post 42. Above said arm clamp 41 is placed another arm clamp 35 upon said spindle 32, with an extended portion 36 which extends upward and in the lower side is provided with slot 34^a adapted to fit over pin 34 which extends through spindle 32 and guides the upper arm clamp 35. The top end of said spindle is provided with a thread 30 on which thumb nut 38 is adapted to screw. The portion 37 extends downward adjacent to portion 36. Over portions 36 and 37, a compression spring 39 is placed, for the purpose of keeping a slight tension on the upper arm clamp 35, when the thumb nut 38 is released, for adjusting the arm 20 between the two arm clamps 35 and 41. On said spindle 32 is placed adjusting arm 20 and washers 40, one on each side, for the purpose of binding the arm 20 when the nut 38 is tightened. Said adjusting arm 20 is provided with a slot 28, a trifle wider than the spindle 32, and adapted to allow adjustment of the arm 20 endwise. Upon the extended end of said arm 20, near the end, is mounted a catch 14 upon stud 11, on the lower end of which, is provided an eccentric 18, which is operated by means of spring 26 on pin 25. Said spring 26 is held in position by means of screw 27. Around stud 11 and attached to arm 20 is bushing 21, which is cut down on its one side, and the shoulders thereof act as stops for a pin 12 which is set in catch 14. It can readily be seen that with this method of construction, after adjusting the clamp 5 upon tube 3, then setting the needle in the end of the record groove, with nut 38 released and set

ting point 10 of the catch in bend 6 of the clamp, then tightening thumb nut 38 and starting the machine as usual, when point 10 slightly touches the inside of bend 6 it will move it sufficiently to throw the eccentric 18 over the center, which gives the spring 26 a chance to expand, the catch 14 will be thrown around, one half turn, until pin 12 strikes shoulder 24,—in the position shown in Figs. 4 and 5,—and when the machine comes around again, the curve 13 on catch 14 will come in contact with tongue 8, thus gradually raising the needle and later striking catch pin 9 which stops the machine. Having thus described my invention, what I claim and desire to secure by Letters Patent is:—

1. A talking machine comprising a rotative record disk and a reproducer movable relatively thereto, a catch mounted upon and adjustable radially of said disk, to rotate therewith and means including an inclined member mounted upon said reproducer and operative to interlock with said catch to raise the reproducer and stop the record disk, all substantially as set forth.

2. In a sound reproducing machine, the combination of a center post, a spindle set vertically in a hole in said center post, an arm provided with a slot and mounted upon said spindle, a pin on said spindle to prevent its turning relatively to the post, clamps on said spindle on each side of said arm, means for tightening said clamps, a stud set on the extended end of said arm, a catch mounted thereon, said stud being provided with an eccentric for turning said catch one-half turn, means for stopping said catch at each end of the one-half turn, a sound tube, a clamp adjustably mounted on said sound tube, an extended normally inclined tongue in connection with said clamp, and a pin on said tongue, said tongue and pin being adapted to operate in connection with said catch to raise the needle and then stop the machine, all substantially as set forth.

3. In a sound reproducing machine, the combination of a center post, a spindle provided with a pin to prevent its turning set in said center post, an arm provided with a

slot and mounted upon said spindle, clamps on said spindle on each side of said arm, a thumb nut screwed on the top end of said spindle for tightening said clamps, a spring to provide slight tension on the clamp at all times, a catch mounted on a stud set in the extended end of said arm, said stud being provided with an eccentric for turning said catch one-half turn, spring means for operating said eccentric, a bushing with shoulders for stopping said catch at each end of the one-half turn, a sound tube, a clamp adjustably mounted on said sound tube, an extended normally inclined tongue in connection with said clamp and a pin on said tongue, said tongue and pin being adapted to operate in connection with said catch to raise the needle and then stop the machine, all substantially as set forth.

4. In a sound reproducing machine, a mechanism for raising the needle and later stopping the machine, comprising, a sound tube, an inclined tongue on said tube, a center post, a vertical spindle set into a hole in said center post, means for preventing its turning therein, a slidable arm provided with an adjusting slot on said spindle, clamps provided with washers on their faces for holding said arm in its adjusted position, a nut on the top end of said spindle for tightening said clamps, a tension spring adapted to provide tension on said clamp for the purpose of holding said arm in position when the nut is released, a vertical stud on said arm, an eccentric on said stud, spring means for operating said eccentric, a catch adapted to operate in connection with said inclined tongue, a bushing provided with shoulders adapted for stopping said catch mounted on said arm, a pin in said tongue and clamp means for attaching said pin and said tongue to said sound tube, all substantially as set forth.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

WILFORD G. ALTENBURGH.

Witnesses:

ERNEST L. BULLEN,
GUY A. RAYMOND.

1. 405. 1. 1

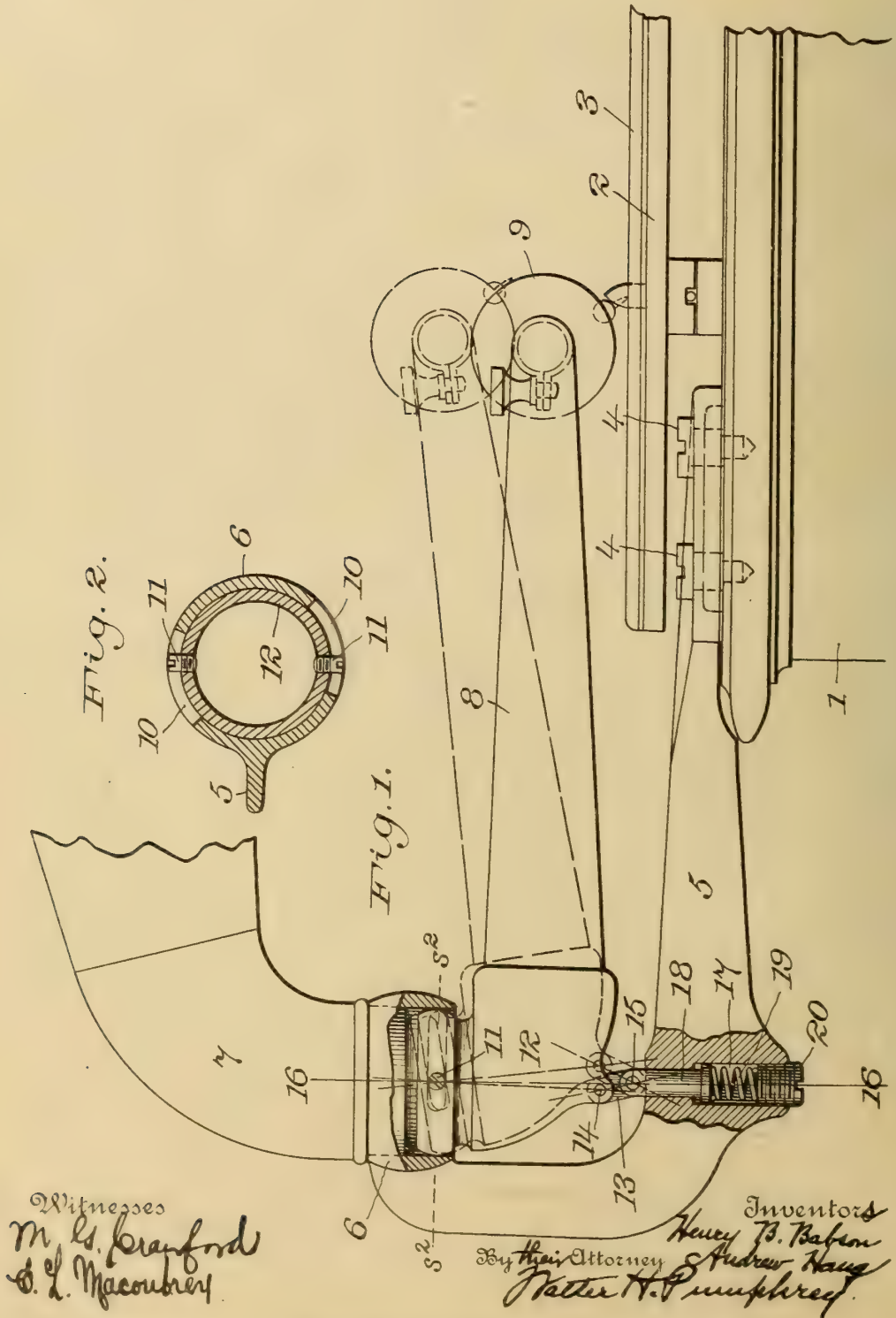
H. B. BABSON & A. HAUG.

TALKING MACHINE.

APPLICATION FILED FEB. 11, 1909. RENEWED MAR. 4, 1911.

1,005,765.

Patented Oct. 10, 1911.



UNITED STATES PATENT OFFICE.

HENRY B. BABSON AND ANDREW HAUG, OF NEW YORK, N. Y., ASSIGNORS, BY MESNE ASSIGNMENTS, TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

TALKING-MACHINE.

1,005,765.

Specification of Letters Patent.

Patented Oct. 10, 1911.

Original application filed May 7, 1905, Serial No. 248,872. Divided and this application filed February 11, 1909, Serial No. 477,323. Renewed March 4, 1911. Serial No. 612,404

To all whom it may concern:

Be it known that we, HENRY B. BABSON and ANDREW HAUG, citizens of the United States, both residing at New York, county and State of New York, have invented certain new and useful Improvements in Talking-Machines, of which the following is a specification.

Our invention relates generally to talking machines and particularly to means for yieldingly supporting the reproducer above and clear of the record when the machine is not in use or while one record is being substituted for another, this application being a division of our application Serial No. 248,872.

A device suitable for carrying our invention into effect is illustrated in the accompanying drawings. We wish it understood, however, that we do not limit ourselves to either the exact construction or arrangement of parts shown, as various changes may be made therein without departing from the spirit and scope of our invention.

In the drawings—Figure 1 is a view in side elevation, partly in section, illustrating the application of our invention to a well known disk type of talking machine, and Fig. 2 is a sectional view taken on the line s^2 , s^2 , of Fig. 1.

Referring now to the drawings, 1 represents the casing of the machine, 2 the rotating table thereof which serves as a support for the record 3. Secured to the casing by screws 4, there is a bracket arm 5, provided with a sleeve like collar 6, in which the small end of the horn 7 and the shaped end of the taper arm 8 are fitted in the usual manner. At the outer free end of the taper arm, the sound box or reproducer 9 is secured. The bracket sleeve 6 is slotted at diametrically opposite points, as indicated at 10, to receive studs, pins, screws or the like 11, which serve to support the taper arm in suspended relation in the sleeve, in a manner to permit free vertical and horizontal movement thereof.

When the machine is not in use or during the time required to substitute one record for another, it is customary to swing the reproducer upward, as indicated in dotted lines and in order to yieldingly maintain it in such position, we employ a suitable locking device, which is arranged to co-

operate with the taper arm, as shown in Fig. 1. The locking device, as herein embodied, operates on the well known principle of a pair of toggle levers, one of which is formed by the elbow 12 of the taper arm and turns about the center 11 and the other, by the link 13, pivoted to the elbow at 14 and turning about the center 15. As arranged, it will be seen that when the reproducer is in contact with the record, as represented in full lines, the pivot pin 14 will be shifted to the left of the line of centers indicated at 16 and when swung upward, the pivot pin will be carried across, to the opposite side thereof, as represented in dotted lines.

The bracket arm is bored out as indicated at 17, to receive a headed pin 18, to the upper projecting end of which the link 13 is pivoted. A spring 19, interposed between the lower end of the pin and a tension screw 20, acts through the pin to maintain the pivot 14 either to the right or left of the line of centers, depending upon the position of the reproducer and at the same time, yields as required, to permit the pivot 14 to swing across the line, as the reproducer is raised or lowered.

From the foregoing it will be seen, that when the reproducer is swung upward, the spring coacting with the toggle locking device, will yieldingly support it in such elevated position and on lowering the reproducer, the action of the spring will be reversed and it will then tend to maintain the reproducer in engagement with the record, under more or less pressure, which may be varied as desired by turning the tension screw either to the right or left.

The particular form, arrangement, position, etc., of the locking device is unimportant and may be changed in any manner desired, it being essential only that it shall operate on the toggle principle, as above described.

Having, therefore, described our invention, we claim:

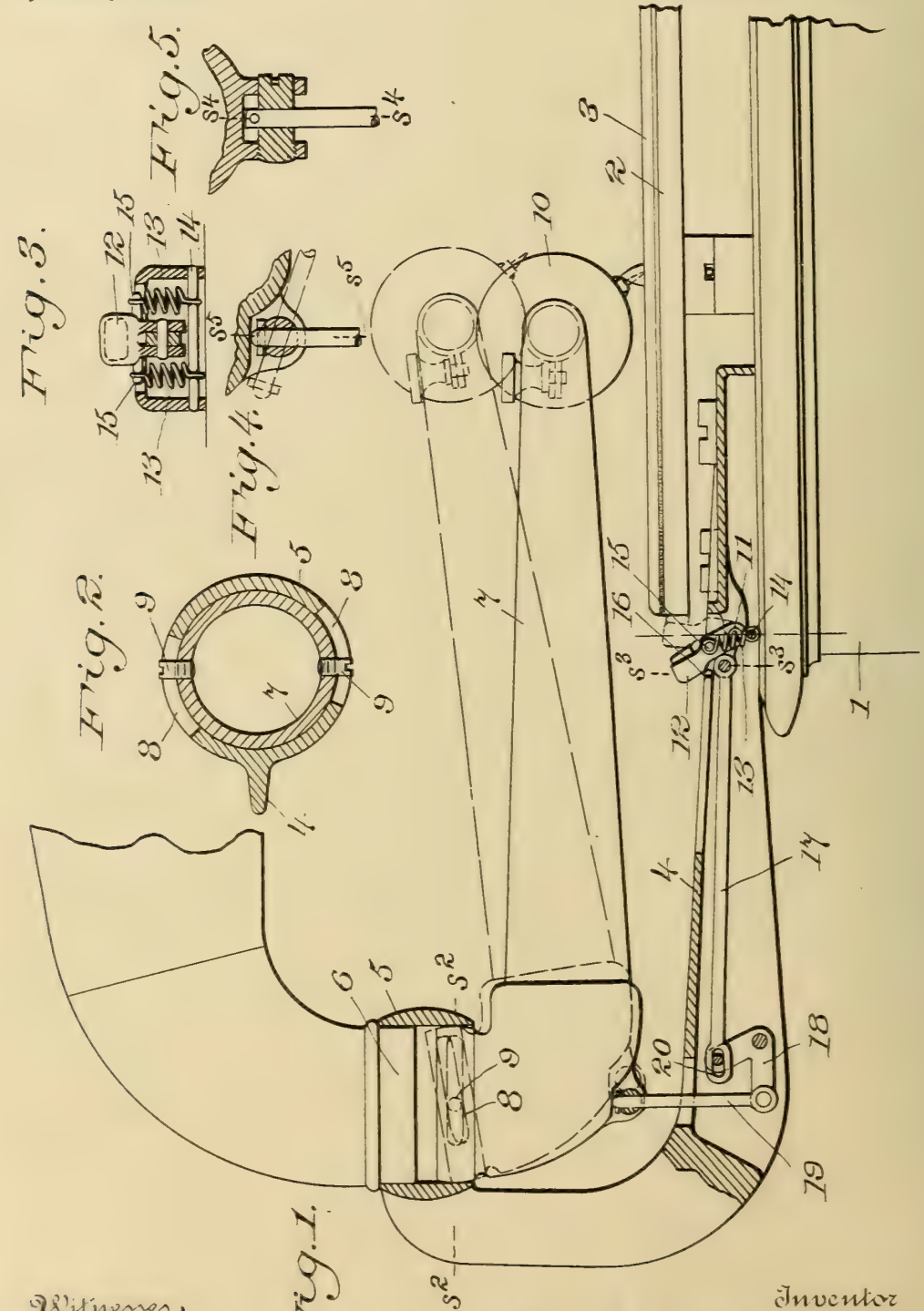
1. In a talking machine, the combination of a rotating record, a cooperating reproducer, a spring opposing movement of the reproducer away from the record, and means for reversing the action of the spring when the reproducer is swung clear of the record.

2. In a talking machine, the combination of a rotating record, a cooperating reproducer, a spring opposing movement of the reproducer away from the record, means for reversing the action of the spring when the reproducer is swung clear of the record, and means for varying the tension of the spring.
3. In a talking machine, the combination of a rotating record, a cooperating reproducer, a spring opposing movement of the reproducer away from the record, and means for utilizing the spring as a yielding support for the reproducer when swung clear of the record.
4. In a talking machine, the combination of a rotating record, a cooperating reproducer, and a spring acting to yieldingly maintain the reproducer in both operative and inoperative positions relative to the record.
5. In a talking machine, the combination of a rotating record, a cooperating reproducer, a spring acting to yieldingly maintain the reproducer in contact with the record, and means for reversing the action of the spring when the reproducer is swung clear of the record.
6. In a talking machine, the combination of a rotating record, a cooperating reproducer, a pin about which the reproducer turns as a center, and a spring acting through the pin upon the reproducer to yieldingly maintain it in both operative and inoperative positions.
7. In a talking machine, the combination of a rotating record, a cooperating reproducer, a spring pin about which the reproducer turns as an axis, and means forming a toggle connection between the pin and the reproducer.
8. In a talking machine, the combination of a rotating record, a cooperating reproducer, a spring, and a toggle connection through which the spring acts upon the reproducer.
9. In a talking machine, the combination of a rotating record, a cooperating reproducer, a member movable with the reproducer, a spring opposing movement of said member, and a toggle joint connecting the member and the reproducer.
10. In a talking machine, the combination of a rotating record, a cooperating reproducer mounted to swing about a vertical axis, and toggle levers operatively connected with the reproducer in the line of its axis.
11. In a talking machine, the combination of a rotating record, a cooperating reproducer mounted to turn upon a vertical support, and toggle members forming part of said support.
12. In a talking machine, the combination of a rotating record, a cooperating reproducer mounted free to swing in planes parallel and at right angles to the surface of the record, and means interposed to form a toggle joint between a fixed point and one of the turning axes of the reproducer.
13. In a talking machine, the combination of a rotating record, a cooperating reproducer mounted free to swing in planes parallel and at right angles to the surface of the record, a spring, and interposed means forming a toggle joint between the spring and one of the turning axes of the reproducer.
14. In a talking machine, the combination of a rotating record, a cooperating reproducer mounted free to swing in planes parallel and at right angles to the surface of the record, a yielding member, and means interposed in the line of one turning axis of the reproducer to form a toggle joint between the other turning axis thereof and said yielding member.
- In testimony whereof, we affix our signatures, in the presence of two witnesses.
- HENRY B. BABSON.
ANDREW HAUG.
- Witnesses:
S. L. MACOUBREY,
M. G. CRAWFORD.

W. H. PUMPHREY.
TALKING MACHINE.
APPLICATION FILED DEC. 3, 1906.

1,006,128.

Patented Oct. 17, 1911.



Witnesses
O. L. Macomber
M. G. Crawford

Fig. 1.

Inventor
Walter H. Pumphrey.

UNITED STATES PATENT OFFICE.

WALTER H. PUMPHREY, OF NEW YORK, N. Y., ASSIGNOR TO AMERICAN GRAPHOPHONE CO., OF BRIDGEPORT, CONNECTICUT, A CORPORATION OF WEST VIRGINIA.

TALKING-MACHINE.

1,006,128.

Specification of Letters Patent.

Patented Oct. 17, 1911.

Application filed December 3, 1906. Serial No. 346,026.

To all whom it may concern:

Be it known that I, WALTER H. PUMPHREY, a citizen of the United States, residing at New York city, borough of Manhattan, in the county and State of New York, have invented certain new and useful Improvements in Talking-Machines, of which the following is a specification.

My invention relates generally to talking machines and particularly to means for automatically controlling the rotating table or support which carries the record.

The object of the invention is to do away with the hand-operated brake now commonly employed in talking machines and cause the rotation of the record supporting table to be automatically controlled by the sound-box or reproducer, which, in being lowered into engagement with the record or swung upward clear of the same, actuates a suitable brake device in a manner to limit the rotation of the record supporting table to periods when the reproducer is in contact with the record.

A further object is to utilize the brake as a means of yieldingly supporting the sound-box in the position it usually occupies above and clear of the record when the machine is not in operation or while one record is being substituted for another.

Mechanism suitable for carrying my invention into effect is illustrated in the accompanying drawings. I do not wish to be understood, however, as limiting myself to either the exact form or arrangement of parts shown, as various changes may be made therein without departing from the spirit and scope of my invention.

In the drawings—Figure 1 is a side elevation, partly in section, of a talking machine of a well known type, showing my invention applied. Fig. 2 is a detail cross section on the line s^2 , s^2 , of Fig. 1. Fig. 3 is a similar view on the line s^3 , s^3 , of Fig. 1. Fig. 4 is a detail section on the line s^4 , s^4 , of Fig. 5, and Fig. 5 is a like view on the line s^5 , s^5 , of Fig. 4.

Referring now to the drawings, 1 represents the casing of the machine, 2 the rotating table on which the record 3 is supported, 4 a bracket secured to the casing and provided with a vertically disposed sleeve-like off set 5, to receive the small end of the horn 6 and the shaped end of the tapered arm or sound conveying tube 7. The sleeve

is slotted upon opposite sides as indicated at 8 and projecting into the slots, there are oppositely disposed screws or studs 9, which serve to secure the taper arm in position and support the same free to swing vertically and horizontally. At the outer end of the arm 7, a sound-box 10 is mounted in the usual manner to coöperate with the record carried by the rotating table above referred to, the arm 7 and sound-box 10 forming the reproducer.

The construction thus far described is that found in machines now in general use and forms no part of the present invention, being here employed for purposes of illustration only and it will be understood that the invention is not limited in its use to the particular type of machine shown.

Pivotally mounted upon a cross pin 11 of the bracket 4, there is a brake-arm 12, the free end of which is recessed to receive a piece of felt or other material suitable for frictionally engaging the edge of the rotating table.

Under the action of twin springs 13, arranged one on each side of the arm 12, as shown in Fig. 3, the brake is yieldingly held either in or out of engagement with the table. The springs are secured at their lower ends to a cross pin 14, fixed directly below the pivot pin and have their upper ends hooked over studs 15 of the brake-arm, the arrangement being such that as the brake-arm is moved far enough in either direction to carry the studs over the pivotal center, the springs act to continue the movement and snap the brake forward into engagement with the table or backward against a stop 16, depending upon the direction of the initial movement imparted to the same.

The brake is connected through a link 17, bell-crank 18 and pin 19, to the elbow of the taper arm and thus arranged, it will be seen that as the sound box is lifted from the record, motion will be imparted through the connection described, to the brake-arm, giving it movement forward toward the table until the studs 15 pass over the pivotal center 14 and thereupon, the springs act to complete the movement and yieldingly maintain the brake applied.

It will be observed, that when the brake is thrown on as just described, the return of the sound box is opposed by the brake springs and as a result, the sound box is

yieldingly held by the same in an elevated position, thus dispensing with a separate locking device such as is ordinarily employed for this purpose.

- 5 To throw off the brake, it is only necessary to move the sound-box downward toward the record and the required motion will be imparted to cause the brake-arm to swing away from the table until the springs
10 act to force it back against the stop.

A pin and slot connection indicated at 20, is preferably employed between the bell-crank and the link 17, in order to produce sufficient lost motion to enable the brake to
15 be thrown on or off at any desired point in the vertical movement of the sound-box. The pin 19 is connected to the taper arm by a universal joint indicated at 21, which permits the arm to move freely both vertically
20 and horizontally as required.

In adapting the device to other types of talking machines, the connection between the taper arm and the brake may be changed in any manner desired or the brake may be
25 arranged to cooperate with some member of the motor other than the rotating table or other changes may be made in the construction shown within the meaning of the present invention, the essential feature of which
30 is the automatic control of the brake by the sound-box, the resulting advantages of which will be apparent from the foregoing description.

Having, therefore, described my invention,
35 I claim:

1. In a talking machine, the combination of a rotatable support for a record, a sound-box mounted in operative relation thereto,
40 a brake cooperating with the record support, and a connection through which motion of the sound-box in planes at right angles to the surface of the record is transmitted to the brake.

2. In a talking machine, the combination of a rotatable support for a record, a sound-box mounted in operative relation thereto,
45 a brake cooperating with the record support, and a connection through which motion of the sound-box toward and from the record is transmitted to the brake.

3. In a talking machine, the combination of a rotatable support for a record, a sound-box mounted in operative relation thereto,
50 and means actuated by the vertical movement of the sound-box for controlling the rotation of the support.

4. In a talking machine, the combination of a rotatable record, a cooperating sound reproducer, and means responsive only to
55 movement of the sound reproducer other than that imparted to it by the record, for automatically timing the periods of rotation of the record.

5. In a talking machine, the combination
60 of a rotatable record, a cooperating sound

reproducer, and automatic means controlled by the sound reproducer for limiting the rotation of the record to periods when the sound reproducer is in engagement therewith.

6. In a talking machine, the combination of a rotatable record supporting table, a sound-box mounted to have movement in vertical and horizontal planes, a brake controlling the rotation of the record supporting
70 table, and a connection through which motion of the sound-box in a vertical plane is transmitted to the brake.

7. In a talking machine, the combination of a rotatable record supporting table, a
80 sound-box mounted to have movement in planes at right angles to each other, a brake controlling the rotation of the record supporting table, and a connection through which motion of the sound-box toward the
85 table is transmitted to throw off the brake.

8. In a talking machine, the combination of a rotatable record supporting table, a sound-box mounted to have movement in planes at right angles to each other, a brake
90 controlling the rotation of the record supporting table, and a connection through which motion of the sound-box away from the table is transmitted to apply the brake.

9. In a talking machine, the combination
95 of a rotatable record supporting table, a sound-box mounted to have movement in planes at right angles to each other, a brake controlling rotation of the record supporting table, and a connection through which
100 motion of the sound-box toward and from the table is transmitted to throw the brake off and on.

10. In a talking machine, the combination of a rotating record supporting table, a cooperating sound-box, and a brake for the
105 table responsive to movement of the sound-box toward and from the table and acting when applied, to maintain the sound-box clear of the record.

11. In a talking machine, the combination of a rotatable record supporting table, a cooperating sound-box, and a brake for the
110 table released by movement of the sound-box away from the table and acting when applied, to maintain the sound-box clear of the record.

12. In a talking machine, the combination of a rotatable record supporting table, a cooperating sound-box, and an automatic
120 brake for the table, the application of which automatically follows the movement of the sound-box clear of the record and yieldingly opposes the return thereof.

13. In a talking machine, the combination
125 of a rotating record-supporting table, a cooperating sound reproducer, a table brake, and a spring common to the sound reproducer and the brake, acting to yieldingly
130 hold the brake clear of the table when the

sound reproducer is in engagement with the record.

14. In a talking machine, the combination of a rotatable record supporting table, a co-
5 operating sound-box, a table brake, and a spring controlled by the sound-box in moving the brake in and out of engagement with the table.

15. In a talking machine, the combination
10 of a rotatable record supporting table, a co-operating sound-box, a table brake, a spring co-acting with both the sound-box and brake, and a loose connection through which the spring is controlled by the sound-box.

16. In a talking machine, the combination
15 of a rotatable record supporting table, a co-operating sound-box, a table brake, a spring common to the sound-box and brake acting

to hold the brake on and off, and means for automatically throwing on the brake and
20 simultaneously bringing the sound-box under the influence of the spring.

17. In a talking machine, the combination of a rotatable record supporting table, a co-
operating sound-box, a table brake, a spring
25 for throwing the brake in and out of engagement with the table, and a connection through which the spring acts to hold the sound-box clear of the record when the brake is applied.

In testimony whereof, I affix my signature, in the presence of two witnesses.

WALTER H. PUMPHREY.

Witnesses:

E. L. MACOUBREY,

M. G. CRAWFORD.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,
Washington, D. C."

4007407

H. WOLKE.
 PHONOGRAPH REPRODUCER.
 APPLICATION FILED DEC. 29, 1908.

1,007,407.

Patented Oct. 31, 1911.

Fig. 1

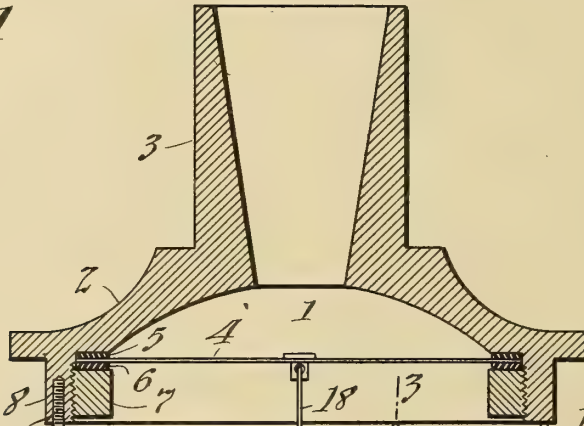


Fig. 3

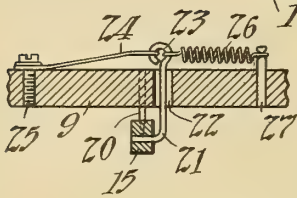
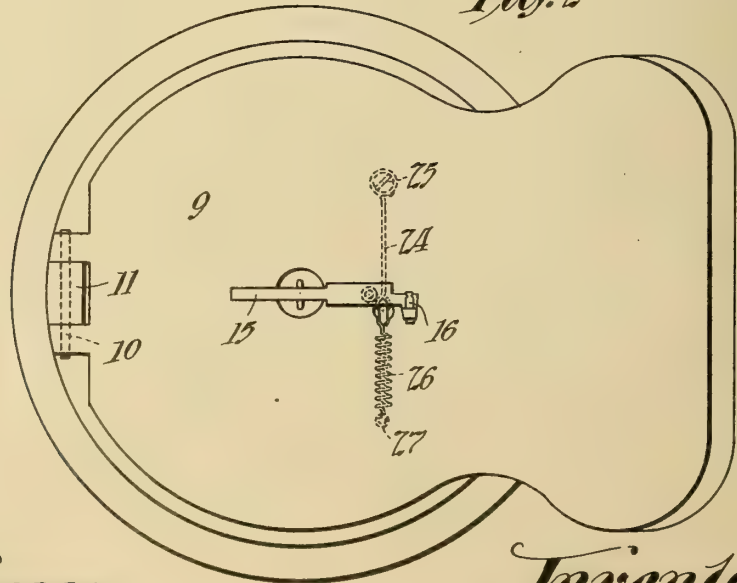


Fig. 2



Witnesses:
 Frank Lewis
 Dyer Smith

Inventor:
 Herman Wolke
 by Frank L. Dyer
 Atty.

UNITED STATES PATENT OFFICE.

HERMAN WOLKE, OF ORANGE, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO
THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

PHONOGRAPH-REPRODUCER.

1,007,407.

Specification of Letters Patent.

Patented Oct. 31, 1911.

Application filed December 29, 1908. Serial No. 469,882.

To all whom it may concern:

Be it known that I, HERMAN WOLKE, a citizen of the United States, and a resident of Orange, Essex county, State of New Jersey, have invented a certain new and useful Improvement in Phonograph-Reproducers, of which the following is a clear, full, and concise description.

My invention relates to phonograph reproducers, and has for its object the provision of an improved mounting for the stylus lever in order that the same may have great freedom of movement in tracking the grooves of the sound record, and in order that the defects due to inertia of the moving parts may be obviated.

More particularly, the object of my invention is to provide a mounting for the stylus, which shall permit the latter to be used in connection with records having two hundred threads to the inch, and track the same faithfully and without injury to the record or the stylus.

While the stylus mounted in the manner of my invention is equally well adapted for use in connection with records having one hundred or some other number of threads per inch, the requirement of great facility of movement of the stylus lever both in a direction parallel to and transverse to the record groove, is particularly important in the case of the two hundred thread record or other record having a great number of threads per inch, owing to the thin walls between the record grooves, which might be broken down or jumped across by a stylus, the parts moving with which have considerable inertia, and owing to the character of the record grooves generally. Accordingly, a stylus mounting of the least possible inertia is very desirable. This is provided for in my invention by providing a universal pivotal connection between the stylus lever and the member supporting the pivot, which member is preferably the usual floating weight well known in the art.

In order to eliminate inertia and friction to the least possible degree, my invention comprises a mounting for the stylus lever in which point friction is substantially substituted for the line friction usual in devices of this character. Furthermore, a device is provided which renders it unnecessary to move any parts other than the stylus lever itself, when said lever is oscillated lat-

erally to the record groove in tracking the same. Furthermore, means are provided by my invention for locating the stylus centrally of the record groove after any deviation from this central position in the tracking of the groove.

Other objects of my invention are the provision of improved details of construction and combination of parts.

In order that my invention may be more clearly understood, reference is hereby made to the accompanying drawings, illustrating a preferred form thereof, in which—

Figure 1 is a central vertical section through a reproducer equipped with my invention. Fig. 2 is a bottom view thereof, and Fig. 3 is a detail sectional view through the floating weight and the stylus lever on the line 3—3 in Fig. 1.

The sound box 1 is formed by the member 2, which has formed integrally therewith the neck 3, to which the phonograph horn may be connected. The diaphragm 4 is clamped in position between gaskets 5 and 6, which are clamped in position between the body 2 of the reproducer and the ring 7, which bears screw threads on the periphery thereof, which are adapted to engage with screw threads on the interior of cylindrical vertical flange 8 of the phonograph body 2. The floating weight 9 is pivotally connected by a pin or screw 10 to a member 11, which is pivotally mounted by means of the screw or short stud 12, which is secured in the flange 8 of member 2 of the reproducer, thus producing a floating weight which is free to oscillate to a certain extent in a direction crossing the plane of the diaphragm, and also in a plane substantially parallel to that of the diaphragm in a manner well known in the art. The pin 13 extending from the periphery of the floating weight at a point diametrically opposed to the pivot of the said weight, and engaging within the stirrup 14, which extends from the adjacent point of the flange 8 of the body of the reproducer, limits the movement of the floating weight in the various directions possible to it, in a manner well known in the art.

The stylus lever 15 carries the stylus 16, and is provided toward the end of the lever opposite to that which carries the stylus, with a hole or passage 17, extending laterally therethrough, and with which the

link 18, which is fastened to the center of the diaphragm in the usual manner, engages. The stylus lever 15 is provided on the upper surface thereof at a point somewhat to the right of the middle of the said lever, as shown in Fig. 1, with a conical recess 19. This inverted cone-shaped cavity or cup 19 is adapted to engage with the point of the pivot pin 20, which is fastened in the floating weight 9 directly above the said cavity 19. The pin 20 is preferably of the fineness of a needle, and the sharpened point of this needle is adapted to engage with the apex of the cone-shaped cavity 19 in the stylus lever 15. By this means a universal pivotal connection having friction at substantially only one point is provided, since, when the stylus 16 is in contact with the phonograph record, the cone-shaped cavity 19 is held by the pressure of the stylus on the record in engagement with the point of pivot pin 20. Since, preferably, the arm of the lever from the pivotal point to the point of connection to the link 18 is considerably greater than the arm of the lever extending from the said pivot to the stylus 16, the up and down movement communicated to the lever by the engagement of the stylus 16 with the record groove, will be communicated to the diaphragm 4 with amplitude.

Since it is necessary to support the end of the stylus lever on the end of the lever opposite that to which the link 18 is connected, and since the needle 20 bearing on the upper surface of the stylus lever furnishes no such support, a means of support for the lever to hold the same approximately in correct position when the stylus is not in contact with the phonograph record, is provided, consisting of a link or wire 21, attached to stylus lever 15 and passing upward through passageway 22 in the floating weight 9. Link 21 is formed at the upper end thereof with a hook 23 to which are attached the wire spring 24 secured to the floating weight as by screw 25, and the spiral spring 26 attached to the floating weight 9 as by pin 27. The springs 24 and 26 are arranged on opposite sides of the wire 21. The spring 24 holds the wire 21 in a definite position relatively to the floating weight above it, the weight of lever 15 subjecting spring 24 to flexure, and the movement of lever 15 in a plane at right angles to pivot 20 subjecting spring 24 to flexure in a plane parallel to said movement of the stylus lever. Spiral spring 26 co-acts with said spring 24 in holding the connection 21 in its central position, in which position the spring 26 is free from both tension and compression. Movement of the lever 15 to either side of its normal axial position extends spring 26. Thus, both springs co-act with gentle force to maintain the stylus

lever in a central position relative to the record groove, although allowing the lever to yield laterally in tracking the record groove. The function performed by the two springs just described could be performed by a single spring, but I prefer the arrangement just described, as it is one which permits greater rapidity and certainty of action.

It is understood that my invention is not limited to the precise device or construction shown, but may be varied within the scope of the appended claims without departing from the spirit of my invention.

Having now described my invention, what I claim and desire to secure by Letters Patent of the United States is as follows:

1. In a phonograph reproducer, the combination with the diaphragm, and the floating weight, of a stylus lever, a stylus borne thereby and a connection between the said lever and the said diaphragm, and a pivot for said lever anchored in said weight and having a pin and socket connection with said lever, substantially as described.

2. In a phonograph reproducer, the combination with the diaphragm, and the floating weight, of a stylus lever, a stylus borne thereby and a connection between the said lever and the said diaphragm, and a pivot for said lever anchored in said weight and having a non-positive connection with said lever, substantially as described.

3. In a phonograph reproducer, the combination with the diaphragm, and the floating weight, of a stylus lever, a stylus borne thereby and a connection between the said lever and the said diaphragm, and a pivot for said lever anchored in said weight and having a non-positive connection with said lever, around which said lever is free to oscillate in planes at right angles to each other, substantially as described.

4. In a phonograph reproducer, the combination with the diaphragm, and the floating weight, of a stylus lever, a stylus borne thereby and a connection between the said lever and the said diaphragm, and a pivot for said lever anchored in said weight, and having a substantially single point connection with said lever, substantially as described.

5. In a phonograph reproducer, the combination with the diaphragm, of a stylus lever mounted entirely below the same and connected at one end with the diaphragm, a stylus borne by the other end of said lever, a member carrying the pivot for said lever, and said pivot, consisting of a pin having its lower extremity bearing against the upper surface of said lever between said diaphragm connection and said stylus, said lever being rotatable about the center line of said pivot as an axis, substantially as described.

6. In a phonograph reproducer, the com-

10 bination with the diaphragm, of a stylus lever mounted entirely below the same and connected at one end with the diaphragm, a stylus borne by the other end of said lever,
 5 a member carrying the pivot for said lever, and said pivot, consisting of a pin having its lower extremity bearing against the bottom of a depression in the upper surface of said lever, the lower extremity of said pin fitting closely within the bottom of said depression, said lever being rotatable about the center line of said pivot as an axis, substantially as described.

15 7. In a phonograph reproducer, the combination with the diaphragm, of a stylus lever mounted entirely below the same and connected at one end with the diaphragm, a stylus borne by the other end of said lever, a member carrying the pivot for said lever,
 20 and said pivot, anchored in said member and having a non-positive connection with said lever, said lever being rotatable about the center line of said pivot as an axis, substantially as described.

25 8. In a phonograph reproducer, the combination with the diaphragm, of a stylus lever substantially parallel thereto and below the same, a link connecting said lever with the diaphragm, and a stylus borne by said lever, a member carrying the pivot for said lever, and said pivot, consisting of a pin having a point bearing against the bottom of a cone-shaped depression in the upper surface of said lever, said lever being rotatable about the center line of said pivot as an axis, and means for centering said lever, substantially as described.

40 9. In a phonograph reproducer, the combination with the diaphragm, of a stylus lever, a link pivoted to said lever and connecting the same with the diaphragm, a stylus borne by said lever, a member carrying the pivot for said lever, and said pivot, consisting of a pin having a point bearing against the bottom of a cone-shaped depression in a surface of said lever, said lever being free to oscillate around said point universally, substantially as described.

50 10. In a phonograph reproducer, the combination with the diaphragm, of a stylus lever mounted below the same, a link pivoted to one end of said lever and connecting the same with the diaphragm, a stylus borne by said lever, a member carrying the pivot for said lever, and said pivot, consisting of a pin having its lower extremity bearing against a point on the upper surface of said lever, and means for supporting said lever on the side of said pivot opposite to said link when the stylus is not in contact with the record, substantially as described.

65 11. In a phonograph reproducer, the combination with the diaphragm, of a stylus lever mounted below the same, a link pivoted to one end of said lever and connecting the

same with the diaphragm and a stylus borne by said lever, a member carrying the pivot for said lever, and said pivot, consisting of a pin having its lower extremity bearing against a point on the upper surface of said lever, and means for supporting said lever on the side of said pivot opposite to said link when the stylus is not in contact with the record, and means for centering said lever, substantially as described.

12. In a phonograph reproducer, the combination with the diaphragm, of a stylus lever connected with the diaphragm and a stylus borne thereby, a member carrying the pivot for said lever, and said pivot, consisting of a pin having its lower extremity bearing at a point on the upper surface of said lever, said lever being rotatable about the center line of said pivot as an axis, means for supporting said lever when the stylus is not in contact with the record, and spring means for centering said lever, substantially as described.

13. In a phonograph reproducer, the combination with the diaphragm, of a stylus lever connected with the diaphragm and a stylus carried thereby, a member carrying the pivot for said lever, and said pivot, about which said lever is arranged to have universal motion, and means for supporting said lever, substantially as described.

14. In a phonograph reproducer, the combination with the diaphragm, of a stylus lever connected with the diaphragm and a stylus carried thereby, a member carrying a member with which said lever has pivotal connection when said stylus is in contact with the record, but which does not support said lever, said lever being rotatable about the center line of said last named member as an axis, substantially as described.

15. In a phonograph reproducer, the combination with the diaphragm, of a stylus lever connected with the diaphragm and a stylus carried thereby, a member, a second member carried thereby and having pivotal connection with said lever when said stylus is in contact with the record, but which does not support said lever, said lever being rotatable about the center line of said last named member as an axis, and means for supporting said lever when said stylus is not in contact with the record, substantially as described.

16. In a phonograph reproducer, the combination with the diaphragm, of a stylus lever connected with the diaphragm and a stylus carried thereby, a pivot for said lever about which said lever is arranged to have universal motion, and a member in which said pivot is supported, said lever having a movement independent of the said member when said lever oscillates transverse to the record groove, substantially as described.

17. In a phonograph reproducer, the combination with the diaphragm, of a stylus lever connected with the diaphragm and a stylus carried thereby, a pivot for said lever 5 about which said lever is arranged to have universal motion, and about which the lever can oscillate free from the inertia of any other moving parts, substantially as described.
- 10 18. In a phonograph reproducer, the combination with the diaphragm, of a stylus lever connected with the diaphragm and a stylus carried thereby, a pivot for said lever 15 about which said lever is arranged to have universal motion, and a member in which said pivot is supported, said lever having a movement independent of the said member 20 when said lever oscillates transverse to the record groove, and the said member also mounted for a limited movement transverse to the said groove, substantially as described.

HERMAN WOLKE.

Witnesses:

DYER SMITH,
ANNA R. KLEHM.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

13305

Reissued Oct. 31, 1911.

Fig.4.

Fig. 5.

Fig.6.

Fig. 3.

A diagram showing a triangle with a circle inside it. The circle is shaded with diagonal lines. The number 6 is written to the right of the triangle, and the number 11 is written below the circle.

Diagram of a triangle with a circle inside, labeled 6.

INVENTORS

A. E. Spencer
F. B. Thomas

By Mrs. Wright-
their attorney.

F. L. Fiedner
Barren Co. C. Glouch.

UNITED STATES PATENT OFFICE.

ARTHUR E. SPENCER, OF SAN FRANCISCO, AND FRANK C. THOMAS, OF MILL VALLEY, CALIFORNIA.

MEANS FOR AUTOMATICALLY ARRESTING TALKING-MACHINES.

13,305.

Specification of Reissued Letters Patent. Reissued Oct. 31, 1911.

Original No. 998,807, dated July 25, 1911. Serial No. 593,636. Application for reissue filed August 17, 1911. Serial No. 644,711.

To all whom it may concern:

Be it known that we, ARTHUR E. SPENCER and FRANK C. THOMAS, citizens of the United States, residing, respectively, at San Francisco, in the county of San Francisco, and Mill Valley, in the county of Marin, and State of California, have invented new and useful Improvements in Means for Automatically Arresting Talking-Machines, of which the following is a specification.

This invention relates to means for arresting the rotation of a talking machine automatically upon the stoppage of the sounds produced by the talking machine.

One object of the invention is to provide a device for accomplishing this and which will not necessitate any change in the form or construction of the record itself or in the mode of using the talking machine.

A further object is to provide such a device of a very simple construction.

In the accompanying drawing, Figure 1 is a broken plan view of a talking machine equipped with our invention; Fig. 2 is a broken side view thereof; Fig. 3 is a detail cross section on the line 3—3 of Fig. 1; Fig. 4 is a detail vertical section on the line *a—*a** of Fig. 1; showing the positions of the parts when the tone tube is elevated; Fig. 5 is a similar view showing the positions of the parts when the tone tube is lowered to its operative position; Fig. 6 is a similar view showing the positions of the parts when the tone tube is also in the lower position but the pin has arrived at the end of the record.

Referring to the drawing, upon the thimble 1 which secures the tone tube 2 to the sound tube 3 is rigidly secured, as by screws 4, an arm 5, from the end of which depends a loop 6. Also secured to said thimble is a small bracket 7, formed with a socket 8, in which can turn a ball 9, having a bearing 10 in which can slide a rod 11 the end of said rod having a head 12 and said rod having collar 13. Said head and collar prevent the rod sliding out of its bearing 10. The rod is flattened where it passes through the bearing, so that it cannot turn therein, and the ball has a pin 14 in a slot 11 in the bracket to prevent the turning of the ball about an axis parallel with the rod. Said rod extends through the loop 6 suspended from the end of the arm 5, and its front or lower end 15 is formed with a bearing 14

in which is secured a small piece of catgut 18 the lower end 16 of which preferably tapers to a fine point. Said bearing 14 is so formed that the catgut can easily be removed and a new piece inserted therein when necessary.

The loop 6 tapers toward the lower end, so that, when the tone tube is raised, the rod 11 passing through said loop 6, rests in said lower end thereof and when the stylus 17 of the talking machine is lowered on to the record 35, the end 16 of the catgut assumes a position slightly nearer the center of the record than the end of the stylus 17. When the catgut descends into contact with the record, it, and the rod 11, are supported by the record, but the loop 6 can drop a short distance lower so that the rod 11 no longer contacts with said loop, but assumes a position centrally thereof, as shown in Fig. 4. When the rod 11 no longer rests in the bottom of the loop the catgut would, but for the groove in the record, be shifted by the rotation of the record in a transverse or radial direction over the record, until the rod 11 assumed a tangential position with reference to the circle described on the record by the lower end of the catgut, and before it arrived at this position, the bearing 14 would contact with the stylus 17. But on account of the record being grooved, this result does not take place, for the catgut is, by the weight of the rod 11, held in the sound-producing spiral groove in the record into which it dropped, and as before stated, is slightly nearer the center than the stylus 17, and, in the rotation of the record, it is compelled to follow said groove always slightly within, or in advance of, the stylus. However, when the catgut arrives at the inner end of the spiral groove it no longer moves in advance of the stylus, the cause of its so moving inward no longer existing. The stylus 17 continues to follow the spiral groove of the record, and, in the rotation of the record, approaches more and more closely to the bearing 14 which holds the catgut, and eventually contacts with the same, and thus connects a circuit 20, which, on the side of the bearing 14, extends through the sound tube and the frame of the machine, and on the side of the stylus extends from the reproducer 21 to a screw 22 which is on the reproducer and thence by a wire

23 to a galvanic cell 24 preferably contained in the box of the talking machine. Since as commonly constructed the reproducer 21 is supported upon the tone tube 2 by an interposed sleeve 19 of rubber, the electric circuit is not closed by said tone tube. In this circuit is an electro-magnet 25 which attracts an armature 26 on a stem sliding in bearings 28 and which carries a collar 29 adapted to actuate the lever 30 used at present to operate the brake 31 of the talking machine. When said lever is actuated, it breaks a contact in the circuit 20, consisting of said lever 30 and a bent wire 32 secured to the electromagnet. When the brake 31 is removed, said contact is again closed by the lever, and the circuit 20 is open at the stylus and catgut holder, and is adapted to be closed in the same manner as before.

When the tone tube is raised for use with another record the arm 11 drops into the tapering lower end of the loop 6, and the holder is therefore out of electrical connection with the stylus, also said arm slides back in its bearing until the collar abuts against the bracket so that the catgut is out of the way when removing the stylus and replacing it by another.

We do not confine our invention to the arrangement here shown in which the stylus itself closes the electric circuit, controlling the brake, as this electric circuit may be closed by contact of any parts moving respectively with the catgut on the one hand and the stylus on the other. Nor do we limit our invention to the means here shown for producing said relative motion, said means being the oblique arrangement of the rod 11 to the arm carrying the stylus, as any positive means could be employed to produce this relative movement when per-

mitted to do so by the arrival of the catgut at the end of the spiral groove.

We claim:—

1. In combination with a rotating record having a record groove, a talking machine having reproducing mechanism, adapted to engage said groove, a device engaging the groove at a different point from the reproducing mechanism, an electric circuit, means movable respectively with said device and said reproducing mechanism and connected to opposite sides of said circuit to close the circuit by contact with each other due to a movement relative to one another of said reproducing mechanism and device, an electro-magnet in said circuit, and a brake for the record controlled by said electro-magnet, substantially as described.

2. In combination with a rotating record having a record groove, a talking machine having reproducing mechanism, adapted to engage said groove, a holder carried by said talking machine, a filament carried by said holder and engaging the groove at a different point from the reproducing mechanism, an electric circuit, means movable with said reproducing mechanism, said means and said holder being connected to opposite sides of said circuit to close the circuit by contact with each other due to a movement relative to one another of said reproducing mechanism and holder, an electro-magnet in said circuit, and a brake for the record controlled by said electro-magnet, substantially as described.

ARTHUR E. SPENCER.
FRANK C. THOMAS.

Witnesses:

FRANCIS M. WRIGHT,
D. B. RICHARDS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

T. H. MACDONALD.
POSITIVELY FED DISK GRAPHOPHONE.
APPLICATION FILED JAN. 8, 1909.

1,008,605.

Patented Nov. 14, 1911.

2 SHEETS—SHEET 1.

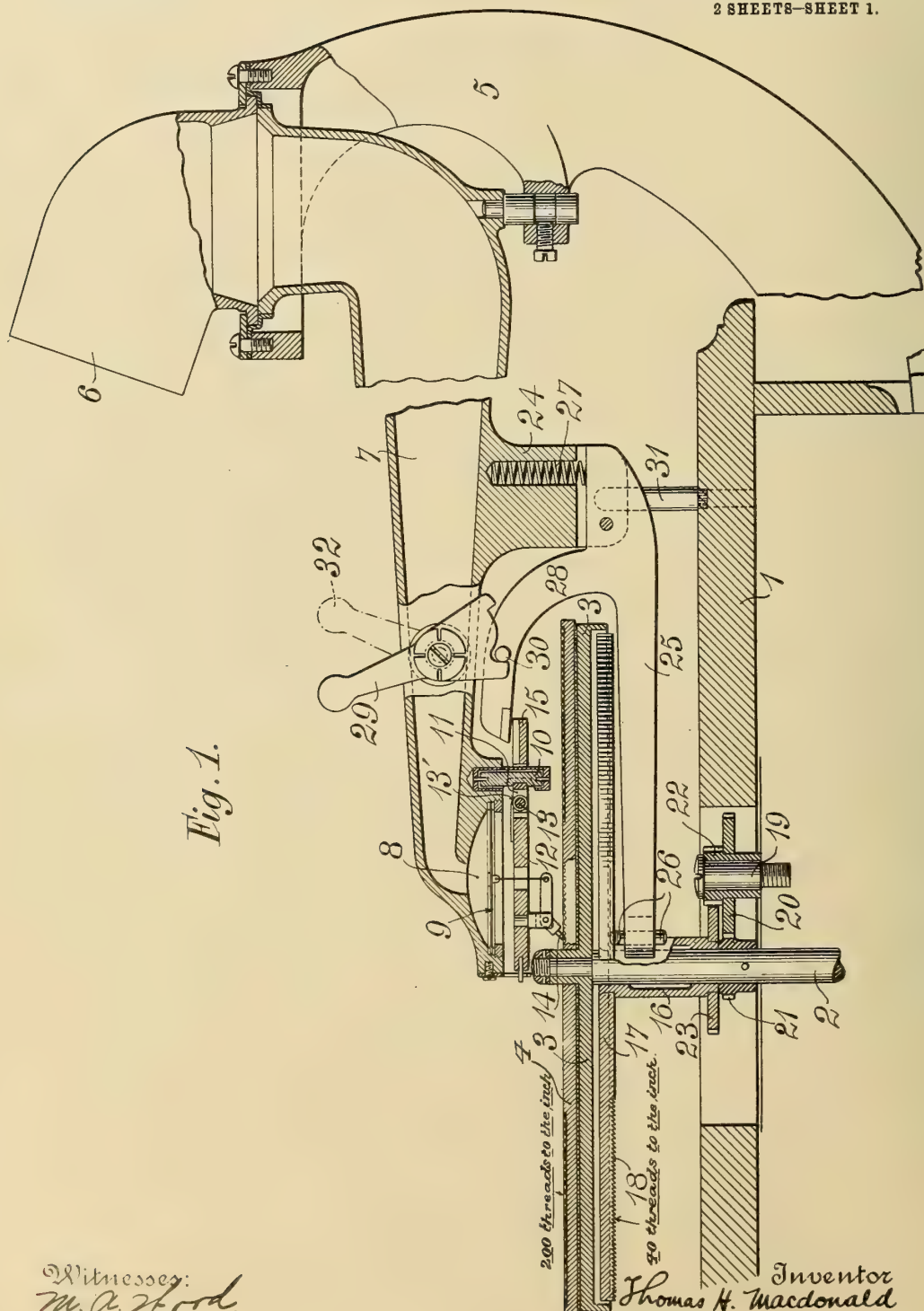
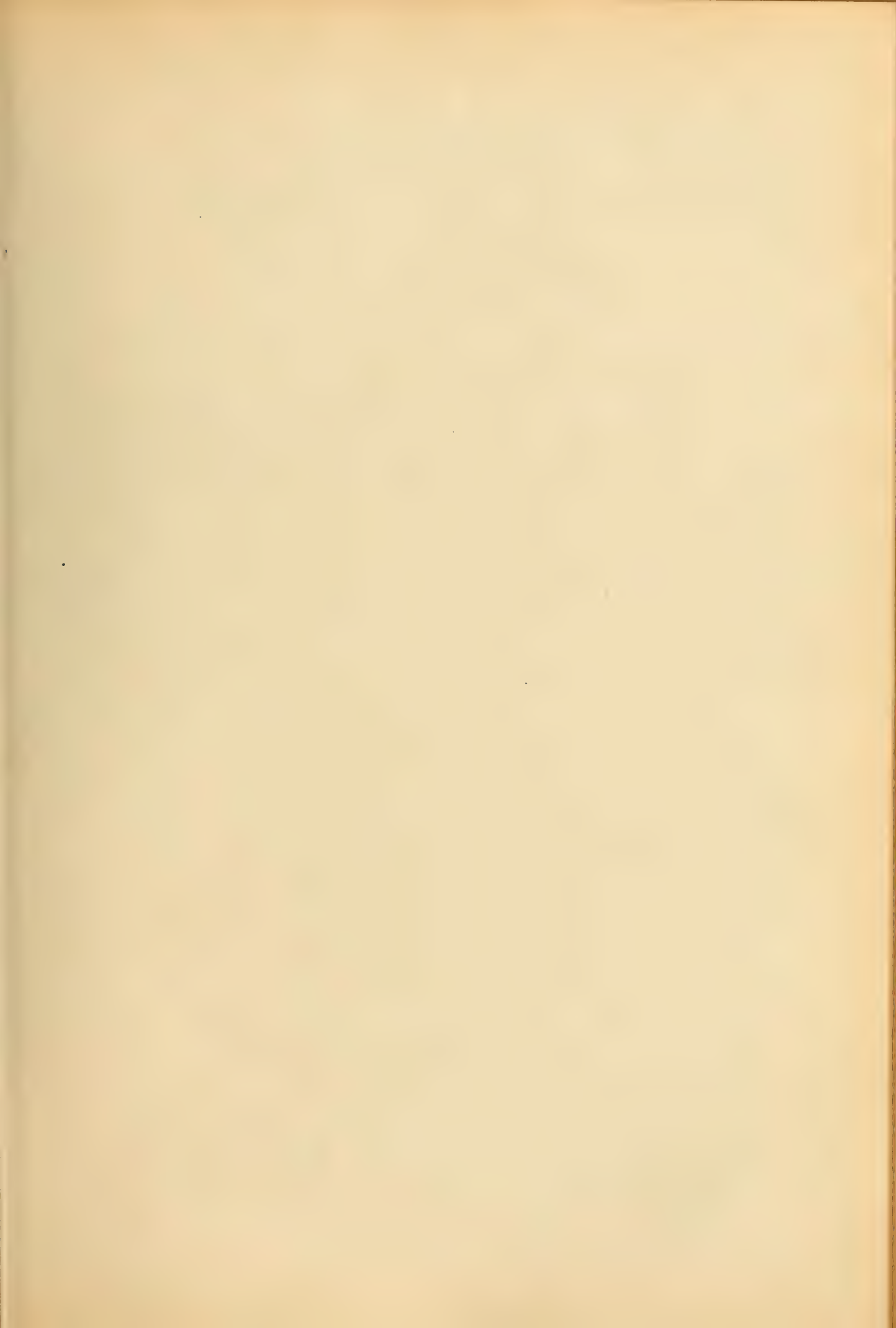


Fig. 1.

Witnesses:
M. A. Wood.
W. A. Williams

Inventor
Thomas H. Macdonald
By his Attorneys.
Mauro, Cameron, Lewis & Massie.

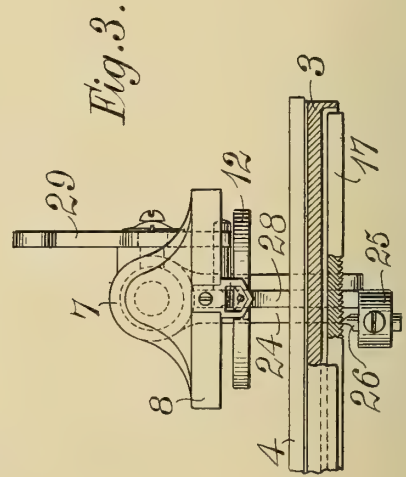
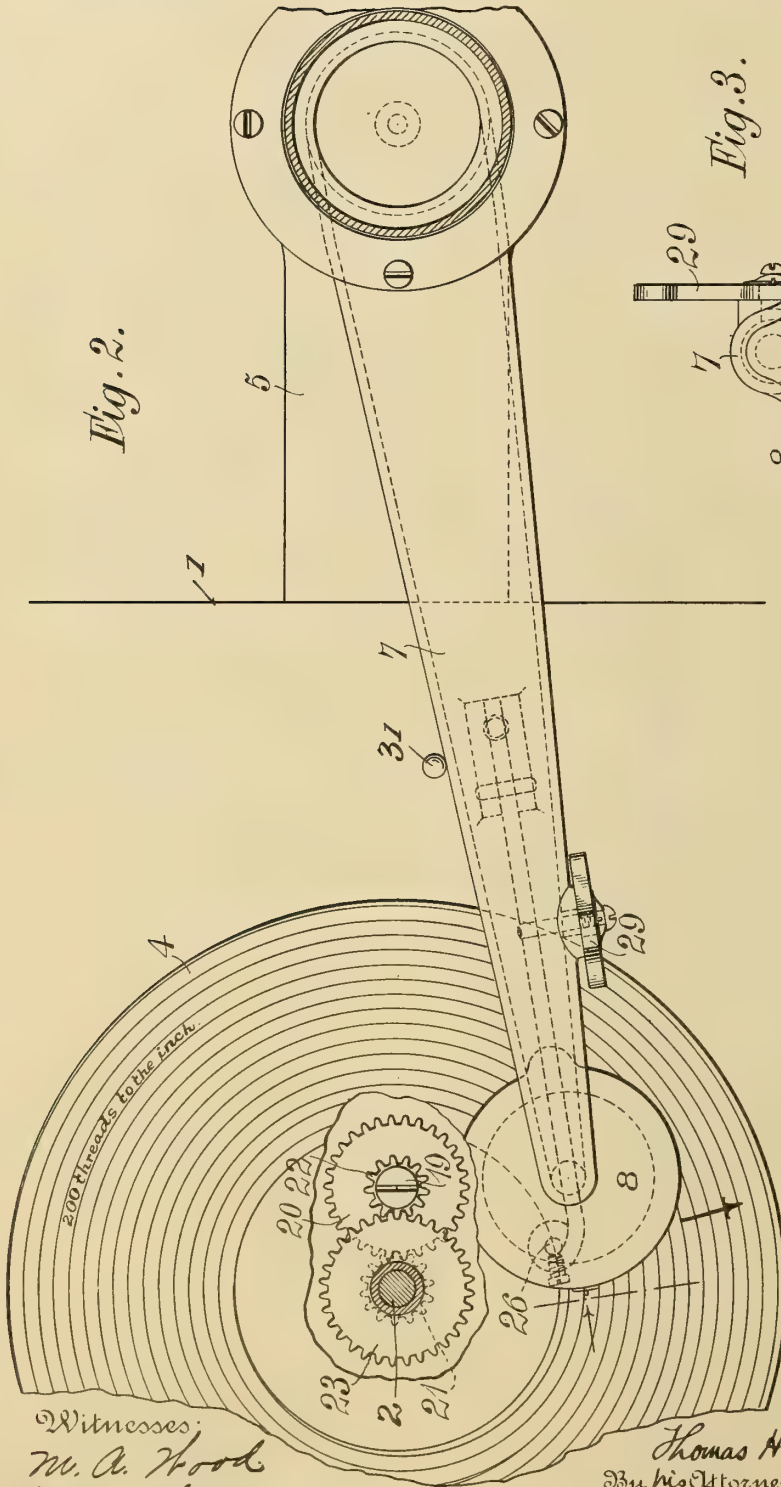


T. H. MACDONALD.
POSITIVELY FED DISK GRAPHOPHONE.
APPLICATION FILED JAN. 8, 1909.

1,008,605.

Patented Nov. 14, 1911.

2 SHEETS—SHEET 2.



Witnesses:
W. A. Hood
W. A. Williams

Inventor
Thomas H. Macdonald,
By his Attorneys,
Mauro, Cameron Lewis & Massey

UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO AMERICAN GRAPHOPHONE COMPANY, OF BRIDGEPORT, CONNECTICUT, A CORPORATION OF WEST VIRGINIA.

POSITIVELY-FED DISK GRAPHOPHONE.

1,008,605.

Specification of Letters Patent. Patented Nov. 14, 1911.

Application filed January 8, 1909. Serial No. 471,332.

To all whom it may concern:

Be it known that I, THOMAS H. MACDONALD, a citizen of the United States of America, and a resident of Bridgeport, Connecticut, have invented a new and useful Improvement in Positively-Fed Disk Graphophones, which improvement is fully set forth in the following specification.

This invention relates to talking-machines employing a sound-record in the form of a disk, and preferably having the record-groove of the up-and-down type rather than of the usual zigzag type.

The object of the invention is to provide, for such talking-machine, positive means for feeding the sound-box across the face of the record-disk.

Another object is to permit the use of a disk sound-record having double, or more than, the usual number of convolutions to the inch.

With the ordinary form of disk sound-record, where the record-groove is of the so-called "zigzag" type, of substantially uniform depth, the side walls of the groove serve to propel or feed the sound-box, besides vibrating the stylus and its diaphragm; but a record-groove of the vertically undulatory type, with varying depth, owing to the comparative shallowness of the groove, and the comparatively gentle slope of its side walls, would not suffice to feed the sound-box with certainty. Again, by providing a positive feed, the machine may be employed, with a suitable recording-stylus, for making the original recordings upon a tablet of suitable material; and such recording-stylus may be mounted to vibrate either longitudinally of its axis (to and from the tablet) or laterally, to produce either the vertically-undulating or the laterally undulating type of sound-record.

One feature of the invention consists of providing a spiral thread or feed screw beneath the turn-table that carries the disk record and concentric therewith, and in co-operation with said screw a guide pin on an arm connected to the sound-box, whereby the feed screw will propel the sound-box (substantially radially) across the face of the record disk.

Another feature of the invention consists in locating the spiral feed screw upon an independent disk separate from the record carrying disk, and giving the feed screw a

comparatively coarse pitch, while providing reduction-gearing whereby the comparatively-slow rotation of the comparatively-coarse feed-screw will feed the sound-box at the proper rate across the face of a record-disk provided with a comparatively-large number of convolutions per inch.

Still another feature of the invention consists of means for disengaging the reproducing-stylus from the record-groove, and for disengaging the feed-arm from the spiral feed-screw, the two actions being preferably performed simultaneously.

The invention consists of one or more of all of the foregoing features, and also of the various details of construction and arrangement to be hereinafter pointed out and claimed.

The invention will be best understood by reference to the annexed drawings that illustrate a preferred embodiment thereof applied to a machine carrying a disk record whose record-groove is of the vertically-undulatory type.

In the drawings, Figure 1 is a vertical section through a portion of a disk graphophone, illustrating a preferred embodiment of my invention; Fig. 2 is a plan view of the same, partly broken away; and Fig. 3 is a detail, viewed from the left in Fig. 2.

Referring to the drawings, 1 represents the box or casing of the graphophone, containing any standard motor, either spring or electric (not shown).

2 is the vertical turn-table shaft rotated by the motor, hereinafter termed the main shaft; upon the upper end of this is mounted the usual horizontal turn-table 3, that carries the disk sound record 4, whose record-groove is a spiral groove of varying depth, as set forth in Bell and Tainter Patent No. 341,244, dated May 4, 1886. Preferably the convolutions of the record-groove upon this disk 4 are two-hundred (200) to the inch, which is double the usual practice.

5 is a standard or bracket secured to the case 1, and carrying the horn 6. The hollow arm, or "tone arm", 7, is pivoted upon the bracket 5 to swing in a horizontal plane only; and it carries rigidly at its free smaller end the sound-box 8, having the horizontal diaphragm 9 parallel to the face of the sound record 4. A vertical pin 10 is swiveled in a depending tube secured near the free outer end of the arm 7; and the

front portion of this tube is cut away to receive the yoke 11 that is secured to the pin. The floating-weight 12 has a square hole, and is passed upward to receive the tube and pin with its yoke; and this floating-weight is secured to the yoke by the horizontal pivot-pin 13, so as to swing to and from the diaphragm 9, its play being limited by the usual pin and staple at its free outer end. A spring 13' forces the weight 12 downward. The reproducing-stylus 14 is carried on a lever that is pivoted to this floating-weight, the other end of said lever being connected to the center of the diaphragm by a link that passes through an aperture in the weight 12. The rear 15 of the floating-weight extends beyond its pivot 13. By means of swivel 10 and pivot 13, the floating-weight and its stylus have slight lateral play as well as vertical swing.

16 is a sleeve mounted on the main shaft 2 and freely revolving independently thereof; and 17 is a horizontal metal disk fast on sleeve 16, located beneath turn-table 3 and provided at 18, preferably on its lower face, with a spiral screw-thread whose pitch is forty (40) to the inch. It will be understood that this inverted spiral thread or feed-screw 18 is concentric with the convolutions of the record-groove of the disk 4.

19 is an arbor mounted parallel to the main shaft 2; and upon it turns the gear 20 in mesh with gear 21 fast on main shaft 2, while pinion 22 carried by gear 20 is in mesh with gear 23 on the sleeve 16. The reduction in speed from gear 21 to gear 20, and then from pinion 22 to gear 23 is five (5); so that the turn-table 3 and sound-record 4 will make five (5) revolutions to one (1) revolution by the feed-screw-disk 17. It will be understood, of course, that the figures forty (40) to the inch for the spiral feed-screw, two-hundred (200) to the inch for the convolutions of the record-groove, and five (5) for the reduction-gearing, are merely for the sake of illustration; and that this ratio may be varied as desired.

From a point near the center of the hollow arm 7 is the depending portion 24, and in a slot in the bottom thereof is pivoted the substantially-U-shaped lever 25, that lies in the same vertical plane with hollow arm 7; the lower and longer member of this lever carries the guide-pin 26, adapted to engage in the inverted spiral feed-screw 18, preferably about opposite stylus 13. A spring 27, seated in the portion 24, tends to depress the heel of the lever 25, and thereby holds the guide-pin 26 in engagement with the feed-screw 18. The upper member 28 of the lever 25 terminates just above the heel 15 of the floating-weight, so that when the guide-pin 26 is forced out of engagement with the feed-screw by swinging lever 25 downward, then the member 28 will depress

the heel of the floating-weight and swing the main portion of the weight upward, and thereby lift the stylus 14 out of engagement with the record-groove.

29 is a cam-lever mounted on a horizontal pivot on the side of the hollow arm 7, and co-acting with the horizontal pin 30 on the upper member 28 to swing the entire lever 25 downward; while spring 27 will restore it.

31 is a stop-pin to limit the inward swing of the arm 7 and the sound-box.

In the position shown in Fig. 1, cam 29 permits spring 27 to force the guide-pin 26 into engagement with feed-screw 18, while the upper member 28 permits the stylus 14 to enter the record-groove on disk 4; but when the handle of the cam-lever is moved into the position 32, then the guide-pin 26 is forced out of engagement with the feed-screw, and simultaneously the arm 28 causes the stylus 14 to be disengaged from the sound-record. Preferably the beginning of the record-groove of disk 4 will be near its center, and the sound-box and stylus will be fed from the center outward; so that by merely moving the cam-lever to the position 32, and swinging the arm 7 against the stop 31, and then restoring lever 29, the machine is in proper position to begin the audible reproduction of a sound-record.

When the record-disk 4 is of the ordinary zigzag type, the stylus 14 will be carried on an elbow lever mounted upon the floating-weight 12, transversely of the record-groove, so as to transform the lateral or zigzag vibration of the stylus to vertical vibrations of the horizontal diaphragm; or the mechanism could be otherwise adapted to a vertically-arranged diaphragm, without departing in any case from the spirit of my invention.

I have shown the hollow arm 7 as pivoted so as to have horizontal movement only; but this arm could be secured by a universal joint, in which case instead of the cam-lever on the arm 7, a horizontal rock-shaft would be mounted upon a stationary bearing on the casing 1, to co-act with the lower member of the lever 25, or some other modification could be employed for engaging and disengaging the stylus and the guide-pin respectively.

While I have shown and described an inverted feed-screw, that is, one whose spiral threads 18 are upon the under face of the disk 17, yet the feed-screw need not be inverted, but may lie upon the upper face of a suitably-rotated disk independent of the turn-table; in which case the upper member 28 may extend past pivot 13, or other obvious modifications may be made, in order to engage or disengage simultaneously the stylus and record-groove and the guide-pin and feed-screw respectively.

I have described my invention with some particularity of detail, but only for the sake of clearness, since parts of my invention may be used to the exclusion of other parts, and changes may be made in the construction and arrangement of parts, without departing from the spirit of the invention.

Having thus described my invention, I claim:

1. In a disk graphophone, the combination with the vertical main shaft and its turn-table adapted to carry a disk sound-record, the horizontal swinging-arm carrying a sound-box, a floating weight pivoted upon said sound-box, and the stylus carried thereby and adapted to engage said sound-record, of an independently revoluble disk on said main shaft beneath said turn-table and presenting on its lower face a spiral thread or feed-screw, reduction-gearing between said main shaft and feed-disk, a vertically-swinging U-shaped lever carried by said swinging arm and having one member extending beneath said feed-screw, a guide-pin carried by said member and adapted to engage said feed-screw, the other member of said lever extending above the rear extension of said floating weight, a spring forcing said lever upward to engage said guide-pin and feed-screw and said stylus and sound-record respectively, and a cam-lever adapted to depress said U-shaped lever and thereby disengage said parts.

2. In a disk graphophone, the combination with the revoluble turn-table adapted to carry a disk sound-record, the swinging arm carrying the sound-box, a floating weight pivoted on said sound-box, and a stylus carried by said floating weight and adapted to engage said sound-record, of an inverted spiral thread or feed-screw beneath said turn-table, a vertically-swinging U-shaped lever carried by said swinging arm and having its members adjacent said feed-screw and floating weight respectively, and means for moving said lever upward and downward respectively for engaging or disengaging said guide-pin and feed-screw and said stylus and sound-record.

3. In a disk graphophone, the combination with the turn-table, the swinging arm and sound-box, and a floating weight carried by said sound-box and carrying the stylus, of a lever carried by said swinging arm and extending over the rear extension of said floating weight, and means for moving said lever up or down for lowering or raising said floating weight and thereby engaging or disengaging said stylus and the sound-record.

4. In a disk graphophone, the combination with the turn-table adapted to carry a disk sound-record having a spiral record-groove thereon, the swinging arm carrying the sound box at its free end, and the stylus

mounted on said sound-box and adapted to engage the said record-groove, of an inverted spiral feed-screw whose thread is concentric with the convolutions of said sound-record, means actuated thereby for propelling said sound-box and stylus, and a lever and suitable connections for simultaneously placing the feed-mechanism and the reproducer into and out of operative position.

5. In a disk graphophone, the combination of a horizontal turn-table, an arm swinging horizontally above the same and carrying at its free end a horizontal diaphragm, a floating-weight pivoted upon said arm and carrying a stylus connected to said diaphragm and adapted to engage the record-groove of a disk record upon said turn-table, an inverted spiral feed-screw, a U-shaped member pivoted on said arm and carrying at one end a guide-pin engaging said feed-screw, the other end thereof adapted to raise said floating-weight and stylus, and means for raising or lowering said U-shaped member.

6. In a disk graphophone, the combination of a horizontal turn-table, an arm swinging horizontally above the same and carrying at its free end a horizontal diaphragm, a floating-weight pivoted upon said arm and extending forwardly beneath said diaphragm and rearwardly beyond its pivot, a stylus pivotally mounted on said floating-weight and connected to said diaphragm and adapted to engage the record-groove of a disk record upon said turn-table, an inverted spiral feed-screw, a U-shaped member pivoted on said arm to swing vertically, a guide-pin carried on the lower member thereof and engaging said feed-screw, the other end of said U-shaped member extending above the rearward extension of said floating-weight, and means for swinging said member upward or downward to engage or disengage the stylus and record-groove and the guide-pin and feed-screw respectively.

7. In a disk talking machine, the combination of the horizontal turn-table, the horizontal swinging arm carrying the diaphragm and its free end above said turn-table, the floating-weight mounted to have up-and-down movement between the said diaphragm and turn-table and provided with lateral play, the stylus pivotally mounted upon said floating weight and having connection with said diaphragm, a lever mounted upon said swinging arm and operating to raise said floating weight and stylus, and means normally holding said lever from said operation.

8. In a disk talking machine, the combination with the turn-table and the swinging arm mounted to travel across the same and a diaphragm carried by said arm, of a post-

tive spiral feed-screw, a floating-weight
carried by said arm, a stylus-lever pivoted
on said floating-weight and connected to
said diaphragm, a stylus on said stylus-le-
5 ver adapted to engage a disk sound-record
upon said turn-table, a lever pivoted upon
said swinging arm and at one end carrying
a guide for engaging said feed-screw and
at the other end acting upon said floating-
10 weight, and means for shifting said lever

to engage or disengage said stylus and the
sound-record and the said guide and feed-
screw respectively.

In testimony whereof I have signed this
specification in the presence of two sub- 13
scribing witnesses.

THOMAS H. MACDONALD.

Witnesses:

H. B. KEOUGH,
L. B. NICHOLSON.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,
Washington, D. C."

A. N. PIERMAN.
SOUND REPRODUCER.
APPLICATION FILED MAY 1, 1909.

1,010,311.

Patented Nov. 28, 1911.

Fig. 4

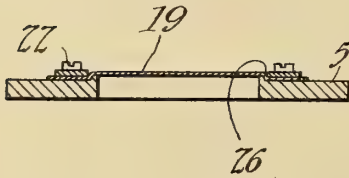


Fig. 1

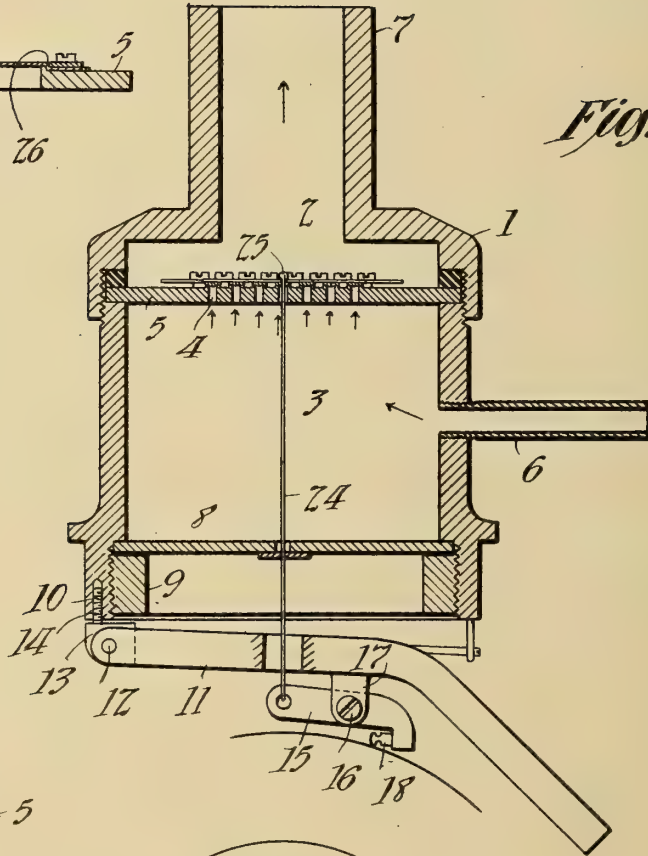


Fig. 3

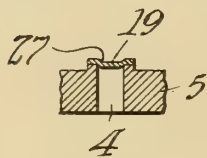
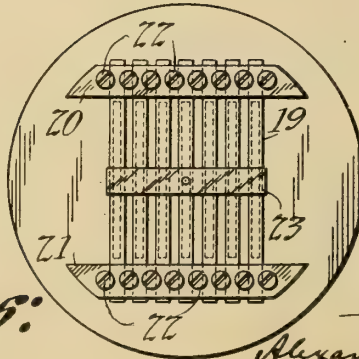


Fig. 2



Witnesses:
Frank D. Lewis
Dyer Smith

Inventor:
Alexander N. Pierman
by Frank L. Roper
Atty.

UNITED STATES PATENT OFFICE.

ALEXANDER N. PIERMAN, OF NEWARK, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

SOUND-REPRODUCER.

1,010,311.

Specification of Letters Patent. Patented Nov. 28, 1911.

Application filed May 1, 1909. Serial No. 493,281.

To all whom it may concern:

Be it known that I, ALEXANDER N. PIERMAN, a citizen of the United States, and a resident of Newark, in the county of Essex and State of New Jersey, have made a certain new and useful Invention in Sound-Reproducers, of which the following is a description.

My invention relates to talking machines of the pneumatic type, or, generally speaking, of the type in which undulations corresponding to sound waves are impressed upon a current of any suitable moving fluid by the operation of a suitable valve through which the fluid is allowed or caused to pass, the valve being operated in accordance with the sound waves, as by connection with a reproducing stylus tracking a record groove.

The objects of my invention are to construct a sound reproducer in which the moving fluid is caused to operate a sensitive valve of a novel character in a novel manner, whereby a sound reproduction of clear and excellent qualities and the desired degree of loudness or amplification is secured.

The valve or vibratory member or members constructed in accordance with my invention is of minimum mass, whereby defects due to inertia and momentum of parts are largely avoided. In accordance with these objects, thin, flexible, reed-like members are interposed in the path of the moving fluid current and are vibrated in accordance with sound vibrations to set up corresponding undulations in the moving fluid current in the sound box of the reproducer.

In the preferred form of my invention, a port plate is provided having one or more slit like ports therein, upon which ports are seated thin, flexible, reed-like members of elastic material which are placed under tension and secured to the port plate at both ends. Also, preferably, these reed-like members are burnished or otherwise given such a conformation that they rest upon the mouths of the ports in close contact, partly within the same, to accurately close the said ports when the members are in their normal position. The reed-like members are joined together and are flexed by connection with the stylus to vary the extent of opening of the ports to a greater or less extent in accordance with the sound vibra-

tions which originally produced the record groove tracked by the stylus.

Other objects of my invention than those referred to above will appear below in the specification and claims.

So far as I am aware, the valves or vibratory members of devices of the general type referred to above constructed prior to my invention have been generally in the form of rigid plates or bodies which are moved bodily in accordance with sound vibrations to vary the extent of opening of the ports, as by moving the same in planes perpendicular to the plane in which the mouths of the ports are situated, or parallel thereto, or by an angular movement, the valves being pivoted or balanced on a knife-edge, or the like, at one side of the ports. It has also been proposed to constitute the valve of elastic material and secure it firmly at one extremity, and vibrate the same across the port opening in the manner of a tuning fork, the material of the valve flexing chiefly in a line adjacent to its point of support, this manner of mounting being therefore similar to the pivotal mounting referred to above. In the case of the rigid valves a considerable amount of mass is necessitated, with consequent inertia and loss of sensitiveness, and in the case of the vibratory valves last referred to, it has been impossible to make the tongues thin and light, since in that case they might set up audible vibrations of their own. The reed-like members of my invention, on the contrary, are held at both ends, preferably under tension, and hence vibrate not like tuning forks but rather in the manner of violin strings. The analogy, however, is not complete. The reed-like members are constrained to vibrate only in accordance with the sound vibrations to be reproduced, and can not produce audible tones of their own. Also, they are of such proportions and so short that they cannot vibrate in parts and produce notes to produce audible tones. The stiffening of the material by the burnishing referred to above also conduces to this result.

Reference is hereby made to the accompanying drawings, forming part of this specification, in which the same reference numerals are used throughout to denote corresponding parts, and in which—

Figure 1 is a side elevation, partly in sec-

tion, of a sound reproducer embodying my invention. Fig. 2 is a plan view of the port plate with the valve members secured thereto. Fig. 3 is an enlarged fragmentary cross section through one of the ports of the port plate showing one of the reed-like members burnished into contact therewith, and Fig. 4 is a detail view showing the preferred method of securing the reed-like members to the port plate under tension.

Referring to the drawings, the sound box 1 may be formed with two chambers 2 and 3 communicating through the ports 4 in the port plate 5, air being conducted into chamber 3 by means of conduit 6 and escaping from chamber 2 through the reproducer neck 7 as is common. The chamber 3 is closed by the closure 8 which is secured in position against the shoulder of the circular wall of the chamber 3 by means of the ring 9 which is screwed into the depending flange 10 of the sound box to hold the closure 8 tightly in position. The floating weight 11 is pivotally mounted at 12 to the block 13 which is mounted as by the screw 14 on the lower surface of the depending flange 10. The stylus lever 15 is pivotally mounted at 16 to the lugs 17 depending from the floating weight, and the said stylus lever is provided with stylus 18. All of the above mentioned parts are common.

The ports 4, which are preferably in the form of lengthened slits, are normally closed by means of the flexible reed-like members 19 seated upon the same. These members are very thin and preferably are formed of a light metal such as aluminium. These reeds are secured in position on the port plate by fastening them securely to the same at both their ends at the opposite extremities of the ports. I prefer to secure the reeds 19 in position by the means shown in the drawings. As there illustrated, the strips 20 and 21 are placed transversely across the ends of reeds 19 beyond the two extremities of the ports 4, and screws 22 are screwed through the strips 20 and 21 and into the port plate 5, the shanks of the screws extending between the reed-like members 19 and the heads of the screws each overlapping one of the said reeds 19 on each side of the same. By this means a very secure connection is made which is at the same time detachable. It is, of course, obvious that members 19 might be secured permanently to the plate 5 as by solder. The reeds 19 are fastened together as by strip 23, which is soldered or otherwise secured to the same transversely of the same and midway between the strips 20 and 21. The link 24 which is attached to the tail of stylus lever 15 is also secured to strip 23. I prefer to use the construction shown in the drawings, in which link 24 passes through a hole in strip 23 and is provided

on the upper side thereof with a button or head 25, so that the upward movement of stylus 18 in tracking the record groove pulls the reeds 19 downwardly at their central points, the pressure of air or other fluid passing from chamber 3 through ports 4 into chamber 2 tending to constantly keep the reeds 19 flexed upwardly. The result of this construction is that when the stylus 18 passes into depressions in the record groove, the current of air or other fluid passing through the port plates flexes the reeds 19 to open the ports to a greater extent, while when the stylus 18 passes over hills or shallower places in the record groove, the link 24 draws the reeds 19 down to reduce the extent of opening of the ports. It is, of course, obvious that the proportion of parts as shown could be changed without departing from the spirit of the invention, and that, if desired, the direction of flow of the fluid could be reversed and the valve seated on the opposite side of the port plate 5 from that indicated with appropriate connection to the stylus lever.

Preferably, the reeds 19 are secured in position and held under a uniform tension. This may be secured in a number of ways, as, for example, that indicated in Fig. 4. Here, the port plate 5 is represented as being formed with slightly raised bearing surfaces surrounding the orifices of the ports on the side of the plate on which the reeds are mounted, the lips so formed having their edges rounded with a smooth curve beyond the ends of the slit-like ports, as shown at 26. The reeds 19 are placed in position over the ports 4 and are so held temporarily by any suitable means. The screws 22 are then secured in position in the portions of the port plate of reduced thickness, as indicated, and by the pressure produced by their heads upon that portion of the reeds 19 lying on curved portions 26 of the port plate 5, a tension is produced which is the same in all the reeds 19, since the adjustment of screws 22 is the same in each case. When the reeds 19 have been properly secured in position, they are preferably forced into close contact with their bearing surfaces, and bent somewhat into the mouths of the ports, in any suitable manner, as with a burnishing tool, as indicated at 27 in Fig. 3, to cause the said reeds 19 to conform closely to the irregularities of the mouths of the ports, and thus normally seat themselves accurately and closely thereon. The valve so produced operates entirely by elastic flexure, vibrating back and forth in symmetrical arcs to a very slight extent to increase or decrease the amount of port opening and admitting the current of air into the chamber 2 in a series of puffs. It would seem that the reeds 19 normally entirely close the ports 4. The valve so constructed

is exceedingly sensitive and copies the vibrations of the stylus with amplification and with great faithfulness. Any desired number of ports and corresponding reeds may be used, the loudness of the sound reproduced varying with the number used.

Where, in the various claims, I have referred to members seated upon the ports, it is to be understood that the reed-like members may be seated upon either the upper or the lower surface of the port plate as previously stated, and by the language used I do not limit myself to the seating of the members upon the upper surface of the plate merely.

Having now described my invention, what I claim and desire to protect by Letters Patent is as follows:

1. In a sound reproducer, the combination of a hollow body containing chambers communicating through a plurality of ports, stretched members of elastic material held rigidly at both extremities, seated upon and covering said ports, and means for flexing the said members in accordance with sound vibrations, substantially as described.

2. In a sound reproducer, the combination of a hollow body containing chambers communicating through a port, a stretched member of elastic material held rigidly at both extremities, seated upon and covering said port, and means for flexing the said member in accordance with sound vibrations, substantially as described.

3. In a sound reproducer, the combination of a hollow body containing chambers communicating through one or more ports, thin members of elastic material seated one upon each of said ports, means situated at both extremities of said members for holding the same immovable at both ends, and means for flexing the said members in accordance with sound vibrations, substantially as described.

4. In a sound reproducer, the combination with a sound box and means for conveying a fluid therethrough, of elongated flexible means interposed in the path of said fluid for producing undulations therein by its flexure, and means for flexing the said means in arcs having their centers in a single straight line in accordance with sound vibrations, substantially as described.

5. In a sound reproducer, the combination with a sound box and means for conveying a fluid therethrough, of a vibrating thin strip interposed in the path of said fluid and held only at both ends for producing undulations in said fluid, and means for causing said strip to vibrate substantially as a whole in accordance with sound vibrations, substantially as described.

6. In a sound reproducer, the combination with a sound box and means for conveying a fluid therethrough, of a vibrating thin

strip interposed in the path of said fluid and held only at both ends for producing undulations in said fluid, and means acting upon said strip substantially midway between its ends for causing the same to vibrate in accordance with sound vibrations, substantially as described.

7. In a sound reproducer, the combination with a sound box and means for conveying a fluid therethrough, of a member interposed in the path of said fluid and provided with a passageway through which the fluid passes, and a vibratory reed covering said passageway and held firmly at both ends, and means for flexing the said reed to uncover the said passageway more or less in accordance with sound vibrations, substantially as described.

8. In a sound reproducer, the combination with a sound box and means for conveying a fluid therethrough, of a member interposed in the path of said fluid and provided with a passageway through which the fluid passes, a vibratory reed held under tension and secured at both ends to cover said passageway, and means for flexing the said reed to uncover the said passageway more or less in accordance with sound vibrations, substantially as described.

9. In a sound reproducer, the combination of a hollow body containing chambers communicating through a plurality of slit-like ports, vibratory reed-like members of somewhat elastic material seated one upon each of said ports and covering the same, means for securing fixedly both the ends of all said members, and means for flexing all said members together to open said ports more or less in accordance with sound vibrations, substantially as described.

10. In a sound reproducer, the combination of a hollow body containing chambers communicating through a plurality of slit-like ports, vibratory reed-like members of somewhat elastic material seated one upon each of said ports and covering the same, means for holding all said members under an equal tension and anchoring the ends thereof, and means for flexing all said members together to open said ports more or less in accordance with sound vibrations, substantially as described.

11. In a sound reproducer, the combination of a hollow body containing chambers communicating through one or more ports, a valve of elastic material rigidly held at both ends and seated upon said ports, and means for flexing the said valve for varying the extent of opening of said ports in accordance with sound vibrations, substantially as described.

12. In a sound reproducer, the combination of a hollow body containing chambers communicating through one or more ports, thin reed-like members of elastic material

normally seated upon said ports and convexed somewhat to fit accurately into the adjacent orifices of the same, means rigidly holding the ends of said members and means
5 for flexing the said members for varying the extent of opening of said ports in accordance with sound vibrations, substantially as described.

13. In a sound reproducer, the combination of a hollow body containing chambers communicating through one or more ports, thin reed-like members of elastic material normally seated upon said ports and constituting a valve, means holding said members rigidly at both ends, a stylus, and connections from the said stylus to the said members for flexing the latter in accordance with the movements of the former in tracking a sound groove, substantially as described.
20

14. In a sound reproducer, the combination with a sound box, of a ported plate therein, means for introducing fluid into said sound box on one side of said plate, a member or members of elastic material secured upon said plate and covering the port or ports in the same on the opposite side thereof, a stylus and a one-way connection from said stylus to said member or members for flexing the same toward the said plate in accordance with movements of said stylus in one direction, substantially as described.
30

15. In a sound reproducer, the combina-

tion with a sound box, of a ported plate 35 therein, means for introducing fluid into said sound box on the lower side of said plate, a member or members of elastic material secured upon said plate at both extremities and covering the said port or ports 40 in the same on the upper side thereof, a stylus below the plate and a one-way connection from said stylus to said member or members for flexing the same toward the said plate in accordance with movements of 45 said stylus in one direction, substantially as described.

16. As a new article of manufacture, a port plate for an air sound reproducer, having slit-like ports therein, and thin flexible 50 reed-like members seated upon said ports and bent or forced into position to normally closely cover the same, substantially as described.

17. As a new article of manufacture, a 55 port plate for an air sound reproducer, having slit-like ports therein, thin flexible reed-like members seated upon said ports and normally closely covering the same, and secured to the port plate at both ends, substantially as described. 60

This specification signed and witnessed this 30th day of April 1909.

ALEXANDER N. PIERMAN.

Witnesses:

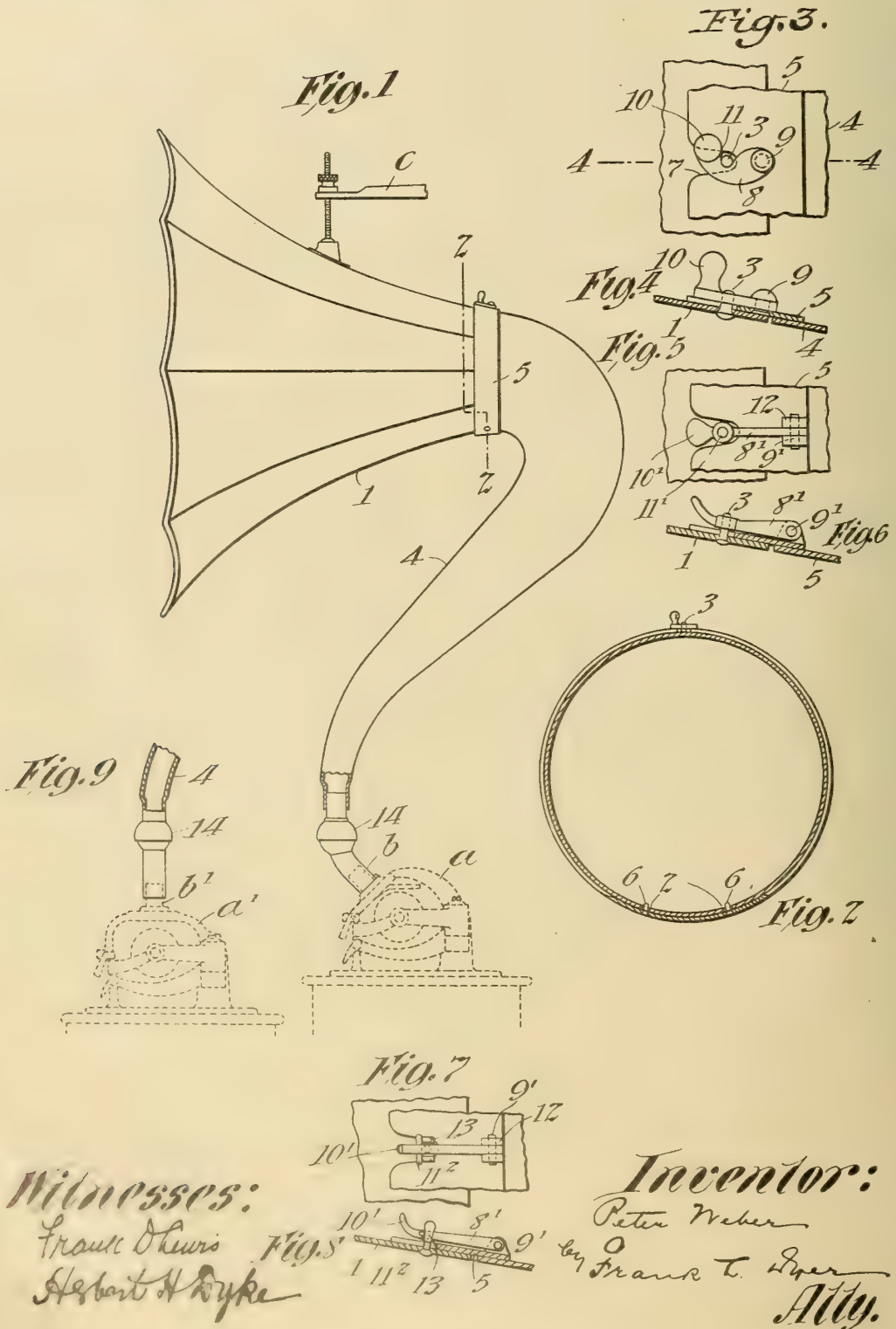
DYER SMITH,
JOHN M. CANFIELD.

1010, 223

P. WEBER.
 PHONOGRAPH HORN.
 APPLICATION FILED MAR. 31, 1908.

1,010,333.

Patented Nov. 28, 1911.



UNITED STATES PATENT OFFICE.

PETER WEBER, OF ORANGE, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

PHONOGRAPH-HORN.

1,010,333.

Specification of Letters Patent.

Patented Nov. 28, 1911.

Application filed March 31, 1908. Serial No. 424,329.

To all whom it may concern:

Be it known that I, PETER WEBER, a citizen of the United States, and a resident of Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Phonograph-Horns, of which the following is a description.

My invention relates to phonograph horns of the type in which the flaring bell is made in a single piece which is separately united to the small end or body portion of the horn, and has been preferably embodied in a horn, the axis of which is curved so that the horn extends upward from the phonograph sound box and the mouth of the bell occupies substantially a vertical plane facing in the same direction as the phonograph, as described and claimed in my application filed October 14, 1907, No. 397,283.

The present invention also relates to improved means for flexibly uniting a horn of this character with the sound box of the phonograph.

In order that the invention may be more fully understood, reference is hereby made to the accompanying drawing of which—

Figure 1 is a side elevation of a horn constructed in accordance with my invention and applied to a phonograph which is illustrated in dotted lines; Fig. 2 is a section on line 2—2 of Fig. 1; Fig. 3 is a detail plan view of the means for locking the bell to the body of the horn; Fig. 4 is a section on line 4—4 of Fig. 3; Figs. 5 and 6 are views similar to 3 and 4 of a modified locking device; Figs. 7 and 8 are similar views of another modification; and Fig. 9 is a view similar to the lower portion of Fig. 1, showing a phonograph in which the nipple of the sound box extends vertically and showing a modified construction of coupling for connecting the lower end of the horn with the said nipple.

The horn shown comprises a bell 1 of metal, wood or other suitable material, the small end of which is provided with a pair of apertures 2 and an outwardly extending pin 3. 4 is a curved section or body, the small end of which is adapted to be connected to the sound box of the phonograph *a*. The large end of the section 4 is provided with a metallic ring 5 of tapered form which has a pair of inwardly projecting pins 6 adapted to be inserted within the openings 2, and said ring is formed with a

notch 7 adapted to receive the pin 3. There is a locking latch 8 pivoted at 9 to the ring 5, the same being formed with a handle 10 and a cam surface 11, which tends to draw the bell 1 into the ring 5 with a wedging action, due to the tapered form of these parts.

In the device of Figs. 5 and 6 there is a locking latch 8' pivoted at 9' to the lugs 12 which are rigid with the ring 5. The forward end of said latch 8' is provided with a handle 10' and the latch has an opening 11' which is adapted to receive the pin 3, and there is the same wedging action of the bell 1 with respect to the ring 5 as the parts are drawn together by the latch 8' being forced down upon the pin 3 into the position shown in Fig. 6.

In the device of Figs. 7 and 8, the latch 8' which is pivoted at 9' to the lugs 12 carried by the ring 5, is formed with a handle 10' and a cross-rod 11', which coöperates with a yoke or Y-shaped member 13 secured to the bell 1, to wedge the bell within the ring 5, the surface of the yoke 13 having a cam action with respect to the cross rod 11'.

The small end of the section 4 may be united to the nipple *b* of the sound box by any suitable flexible connection, but I prefer to use a hollow or tubular ball and socket joint or coupling 14. In the structure shown in Fig. 1, this coupling fits tightly upon the nipple *b* and slides freely within the lower end of the section 4.

In the structure shown in Fig. 9 the phonograph carriage *a'* is of slightly different form, and the nipple *b'* of the sound box extends vertically. With a phonograph of this type, one member of the ball and socket coupling 14 may be integral with the section 4 as shown, and the other member fits loosely upon the said nipple *b'*. In both forms the weight of the horn is carried by a fixed support *c* from which the horn is suspended and the sliding connection between the horn and coupling in Fig. 1 and between the coupling and nipple in Fig. 9, permits the progressive movement or feed of the phonograph carriage without affecting the connection of the sound box with the horn.

Having now described my invention, what I claim is:

1. A phonograph horn comprising separable sections at least one of which has a tapered engaging surface, and means for

uniting the same comprising one or more pins carried by the end of one section and adapted to be inserted in openings formed in the other section, a pivotal latch carried
5 by one section and adapted to engage a projection carried by the other section, said latch and projection being so formed that their engagement draws the sections together with a wedging action, substantially
10 as set forth.

2. A phonograph horn comprising a pair of separable sections at least one of which has a tapered engaging surface, and locking means therefor comprising a latch pivoted
15 to one of said sections, and a pin rigid with the other section, said latch being formed with a cam surface for engaging said pin and drawing said sections together with a wedging action, substantially as set forth.

3. A phonograph horn comprising a pair of separable sections, a stiffening ring applied to the end of one of said sections, a projection rigid with the other section, and a latch pivoted to said ring and adapted to
20 engage said projection for drawing said section and ring together, said latch and pro-

jection being so formed as to exert a wedge-like or cam action on each other during the pivotal movement of the latch substantially
30 as set forth.

4. A phonograph horn comprising a pair of separable sections, a stiffening ring applied to the end of one of said sections and provided with pins and with a notch, the
35 end of the other of said sections being provided with openings adapted to receive said pins and with a projection rigid therewith adapted to be received by said notch, and a latch pivoted to said ring and adapted to
40 engage said projection for drawing said pin into said notch and thereby drawing said section and ring together, said latch and projection being so formed as to exert a
45 wedge-like or cam action on each other during the pivotal movement of the latch, substantially as set forth.

This specification signed and witnessed this 30 day of March, 1908.

PETER WEBER.

Witnesses:

FRANK D. LEWIS,
H. H. DYKE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."



F. L. DYER & F. D. LEWIS.
 PHONOGRAPH.
 APPLICATION FILED JUNE 19, 1909.

1,010,355.

Patented Nov. 28, 1911.

Fig. 1

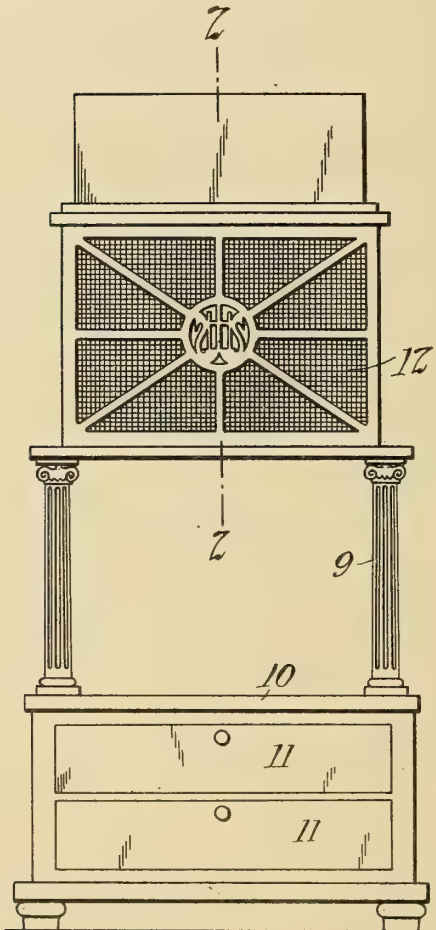


Fig. 2

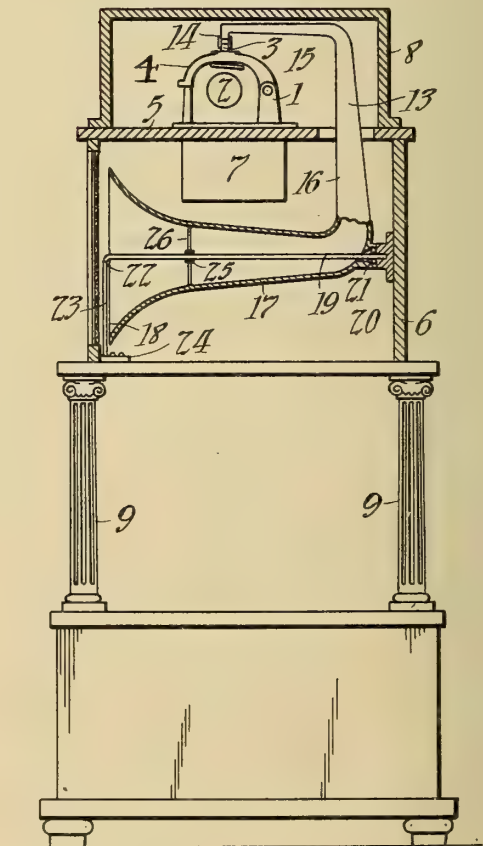
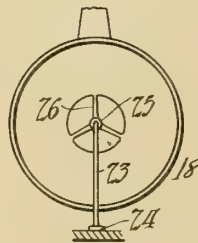


Fig. 3



Witnesses:
 John W. Garfield
 Dyer Smith

Inventors:
 Frank L. Dyer & Frank D. Lewis
 by Frank L. Dyer *Atty.*

UNITED STATES PATENT OFFICE.

FRANK L. DYER, OF MONTCLAIR, AND FRANK D. LEWIS, OF ELIZABETH, NEW JERSEY.
ASSIGNORS, BY MESNE ASSIGNMENTS, TO THOMAS A. EDISON, INCORPORATED, OF
WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

PHONOGRAPH.

1,010,355.

Specification of Letters Patent. Patented Nov. 28, 1911.

Application filed June 19, 1909. Serial No. 503,235.

To all whom it may concern:

Be it known that we, FRANK L. DYER, a citizen of the United States, and a resident of Montclair, in the county of Essex and State of New Jersey, and FRANK D. LEWIS, a resident of Elizabeth, in the county of Union and State of New Jersey, have made a certain new and useful Invention in Phonographs, of which the following is a description.

Our invention relates to phonographs, and the objects thereof are to provide a novel and effective mounting for a phonograph horn or sound conveyer used in connection with a phonograph or other talking machine, and to provide an improved cabinet for a phonograph or talking machine having the horn mounted as herein described entirely inclosed therein.

Other objects of our invention reside in the combinations of parts and constructions of details as hereinafter described and particularly pointed out in the appended claims.

Referring to the accompanying drawings forming part of this specification in which corresponding parts are denoted throughout by the same reference characters, Figure 1 represents a front elevation of our improved cabinet having a phonograph and horn mounted therein. Fig. 2 represents a side elevation of the lower part of the cabinet or supporting means therefor, the upper portion of the cabinet being shown partly in section on line 2-2 in Fig. 1, and Fig. 3 is a detail showing the method of mounting the horn in Fig. 2, the same being an end view of the horn with supporting means.

Referring to the drawings, the phonograph 1 is represented conventionally as being provided with the mandrel 2 and a reproducer 3 mounted on the traveling carriage 4 as is common. These parts are mounted on the upper side of the top 5 of the cabinet 6. The phonograph motor is inclosed within the casing 7, which may be secured to the lower side of top member 5, or any other suitable place in any convenient manner. The phonograph 1 may be covered by the removable cover 8.

The casing or cabinet 6 may be of any suitable design, and as we have shown it, is mounted upon the columns 9 which rise

from the top of the casing 10, which may, if desired, be provided with drawers 11 for holding the phonograph records. The front of cabinet 6 may, if desired, be provided with a grille or fret work 12, by means of which the inclosed horn may be concealed while at the same time the sounds issuing therefrom are allowed freely to pass through the said grille or fret work.

The sound conveyer 13 is connected to the neck of the reproducer 3 by a telescoping connection 14 of well known character. The sound conveyer 13 preferably extending rearwardly from the reproducer 3, as shown at 15, thence downwardly by bend 16, and thence forwardly again in part 17, which extends in substantially a horizontal direction through the inclosing cabinet 6 from back to front, this part constituting a sound amplifying horn of suitable shape and dimensions and terminating preferably in a bell-shaped mouth 18 just behind the grille 12.

The horn 17 and sound conveyer 13 formed integral with or connected thereto are mounted to rotate to a sufficient extent about a fixed axis at right angles to the path of travel of the traveling carriage of the phonograph, the telescoping connection 14 rising or falling with the travel of the carriage in one or the other direction, as the forwardly directed mouth portion of the horn turns about its pivot. Preferably, the axis about which the horn swings as described is the axis of symmetry of the forwardly directed mouth portion 17 of the horn. This pivotal mounting may be provided in a number of ways. As shown in the drawings, the rod 19 is mounted with one end thereof supported at the rear of cabinet 6 by bracket 20. The end of the rod is rotatably supported by bracket 20 in any suitable manner, as by ball bearing 21. The rod 19 passes from bracket 20 into the forwardly directed portion of the horn and proceeds axially therethrough, being bent downwardly as shown at 22 immediately in front of the mouth 18 of the horn, the vertical portion 23 of the rod 19 being provided being rigidly supported by the bracket 24. The horizontal portion of arm 19 passes through a ring or similar suitable bearing

25, which is supported axially within the horn 17 by arms 26.

Having now described our invention, what we claim and desire to protect by Letters Patent is as follows:

1. In a device of the character described, in combination, a traveling carriage, a reproducer thereon, a sound conveyer connected to the neck of the reproducer, said conveyer having a substantially horizontal mouth portion, and pivotal means for supporting said conveyer to permit movement of the same about the axis of the horizontal portion, substantially as described.

2. In a device of the character described, in combination, a traveling carriage, a reproducer thereon, a sound conveyer connected to the neck of the reproducer, said conveyer having a substantially horizontal mouth portion, and a substantially vertical portion, said conveyer being connected to the reproducer by a telescoping joint, said conveyer being pivotally mounted about the axis of the mouth portion thereof, substantially as described.

3. In a device of the character described, in combination, a traveling carriage, a reproducer thereon, a cabinet on which said parts are mounted, a sound conveyer extending from said reproducer into said cabinet and extending forwardly therein, and means for supporting said conveyer to permit movement thereof during the travel of said carriage about a stationary approximately horizontal axis, substantially as described.

4. In a device of the character described, in combination, a traveling carriage, a reproducer thereon, a cabinet on which said parts are mounted, a sound conveyer extending from said reproducer into said cabinet and extending forwardly therein, and means for supporting said conveyer to permit movement thereof during the travel of said carriage about a stationary axis extending at right angles to the path of the traveling carriage, said conveyer being joined to the

reproducer neck by a joint permitting movement axial of the said neck between the neck and the adjacent end of the conveyer, substantially as described.

5. In a device of the character described, in combination, a traveling carriage, a reproducer thereon, a cabinet on which said parts are mounted, a sound conveyer extending from said reproducer into said cabinet and extending forwardly therein, and a rod extending axially through the mouth portion of the conveyer, means for supporting said rod, and means for pivotally supporting said conveyer on said rod, substantially as described.

6. In a device of the character described, in combination, a traveling carriage, a reproducer thereon, a support on which said parts are mounted, a sound conveyer connected to said reproducer and having a mouth portion extending forwardly therefrom and a rod extending axially through the mouth portion of the conveyer, means for supporting said rod, and means for pivotally supporting said conveyer on said rod, substantially as described.

7. In a device of the character described, in combination a controlling carriage, a reproducer thereon, a cabinet having a support on which said parts are mounted, a sound conveyer extending from said reproducer into said cabinet and extending forwardly therein, and means for supporting said conveyer to permit movement thereof during the travel of said carriage about an axis extending at right angles to the path of the traveling carriage, said conveyer being joined to the reproducer neck by a joint permitting movement between the neck and the adjacent end of the conveyer.

FRANK L. DYER.
FRANK D. LEWIS.

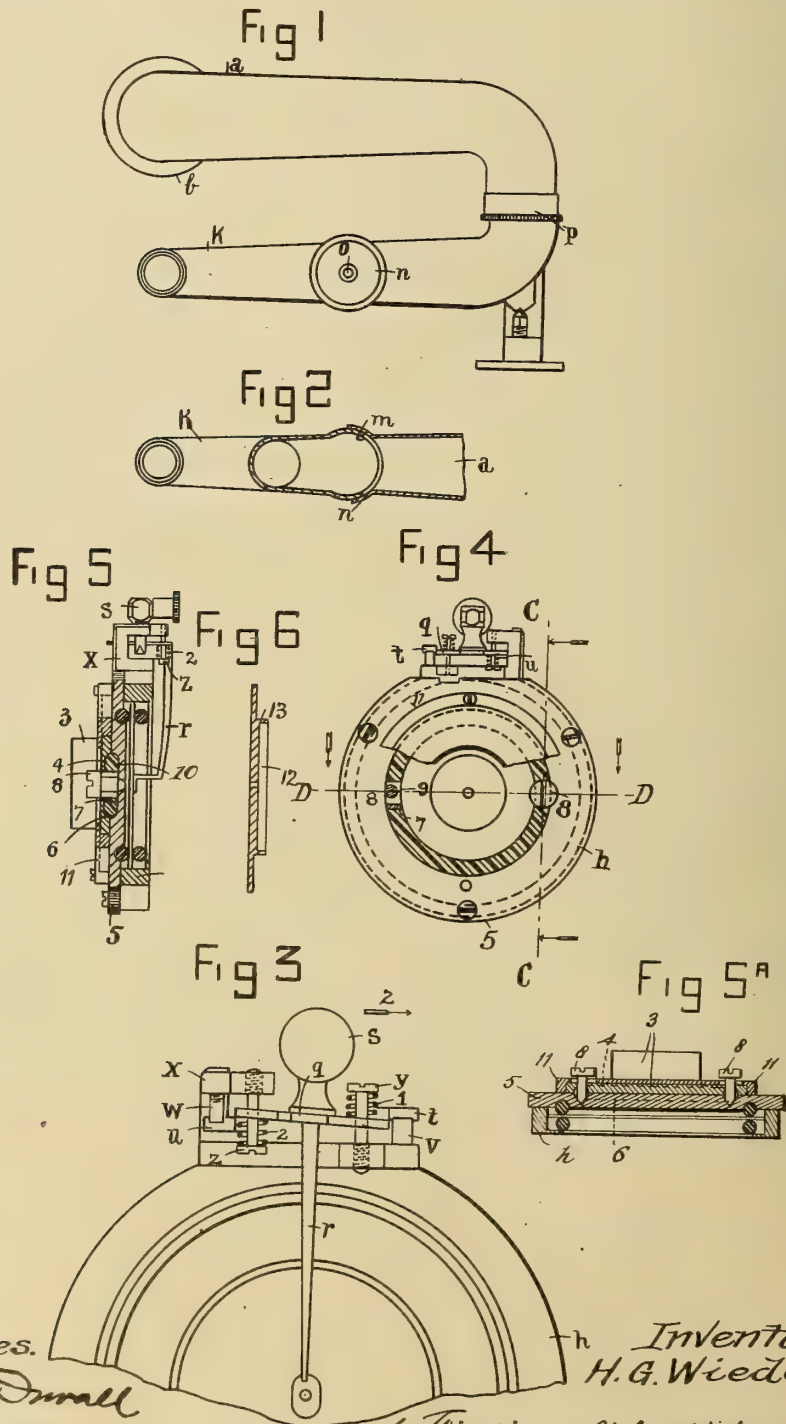
Witnesses:

DYER SMITH,
JOHN M. CANFIELD.

H. G. WIEDER.
SOUND REPRODUCING AND RECORDING INSTRUMENT.
APPLICATION FILED DEC. 18, 1909.

1,011,298.

Patented Dec. 12, 1911.



Witnesses.
W. Map Small
J. S. Givato

Inventor.
H. G. Wieder,
by Willman, Jirka & Wickersham
his attorneys.

UNITED STATES PATENT OFFICE.

HENRY GEORGE WIEDER, OF LONDON, ENGLAND.

SOUND REPRODUCING AND RECORDING INSTRUMENT.

1,011,298.

Specification of Letters Patent. Patented Dec. 12, 1911.

Application filed December 18, 1909. Serial No. 533,772.

To all whom it may concern:

Be it known that I, HENRY GEORGE WIEDER, a subject of the Emperor of Austria-Hungary, residing at 17 Lanark Mansions, Shepherds Bush, London, in the county of Middlesex, England, have invented a new and useful Improvement Relating to Sound Reproducing and Recording Instruments, of which the following is a specification.

This invention relates to improvements in sound reproducing and recording devices such as gramophones, phonographs and the like, and especially relates to the sound box and tone arm employed in such devices.

The main objects of the invention are to improve the swivel connection of the sound arm which carries the diaphragm, to provide improved support for the carrier of the diaphragm lever and needle and to provide an improved resilient mounting for the element which carries the diaphragm and needle support.

The invention further consists in pivotally connecting the portion of the sound pipe which carries the sound box to the rest of the sound pipe in such a manner that the two portions of said sound pipe are coaxial at the joint in their normal working position, and whereby the gradual taper of the sound pipe may be continued to the sound box itself.

According to another part of the invention the needle carrier and diaphragm are mounted on a bar having two projecting knife edged arms bearing in suitable grooves formed one on a pin extending from the sound box, and the other on a pin carried by a bracket attached to said sound box, said knife edges and their corresponding grooves being oppositely turned with respect to each other, and so arranged that the movement of the record against the needle tends to hold the bar more firmly in its bearings.

The invention further consists in mounting a diaphragm and needle carrying element upon the end of the sound tube resiliently in such a manner that it may move somewhat relatively to said end in a circumferential direction but may not move out of its normal plane. By this method of mounting the entire movement of the needle in the direction which affects the diaphragm is transmitted to the diaphragm instead of some of the movement being absorbed in moving the diaphragm carrier out of its

proper plane as occurs in apparatus of this character at present in use.

The invention further consists in an improved diaphragm for sound reproducing and recording instruments consisting of a thin disk of wood, composition or the like with a circular flange or ridge some distance within the periphery, the portion of the diaphragm within this flange or ridge being thickened.

Referring now to the drawings:—Figure 1 is an elevation of a sound pipe having a continual taper; Fig. 2 is a part section of Fig. 1, showing my improved swivel joint; Fig. 3 shows an enlarged view of my improved needle mounting; Fig. 4 is an elevation of my improved diaphragm carrying element with part of the back cover removed; Fig. 5 is a section on the line C—C of Fig. 4; Fig. 5^a is a section on the line D—D of Fig. 4. Fig. 6 is a section through my improved diaphragm.

According to the first part of my invention and in order that the sound pipe *a* may be formed with a continual taper from where it joins the enlargement *b*, to the back plate 5 of the diaphragm carrier *k*, Fig. 4, when a portion of it is arranged with a swivel joint, I arrange the large end of the diaphragm carrying portion *k* of the sound tube *a*, so that it may be coaxial in the working position with the part of the pipe *a* to which it is pivoted and I arrange the ends so that they make a socket joint. This may be done by forming on the end of the pipe *k* an enlargement *m*, having a cylindrical surface struck from an axis at right angles to the axis of the jointed end of the pipe. This cylindrical portion *m* knuckles into a correspondingly formed interior of another enlargement *n* formed on the small end of the pipe *a*, having two ends carrying pivot screws *o*, Fig. 1 which enter recesses not shown at each side formed on the axis of the first cylindrical enlargement *m*. From this socket joint the pipe *k* gradually tapering down may be curved or straight according to the construction of the particular instrument used but for a disk record it is preferably made with a bend, and, in any case is arranged so that when the needle is in operative position upon the record, the axes of the adjacent pieces of the pipe at the joint shall be coaxial instead of at right angles as occurs in usual constructions.

When the device is arranged in a cabinet,

an additional joint as shown at *p*, in Fig. 1, of any convenient construction may be provided in order that the diaphragm carrier *h* may be swung out to a convenient position for adjustment.

According to another part of the invention the bar *q*, or the like, Fig. 3 which carries the diaphragm lever *r*, and the needle holder, is provided with two projecting knife edged arms *t* and *u* adapted to bear in grooves on the ends of the pins *v* and *w*. The knife edges *t* and *u* are arranged in opposite directions as shown, the one, *u*, on the side of the carrier *h*, toward which the record moves (the direction of rotation of the record is shown by the arrows in Figs. 2 and 3) being arranged with its edge toward the record, the pin *w* in which it bears being carried by a bracket *x*, while the other knife edge *t* is arranged in the opposite direction and bears upon the pin *v* projecting upon the diaphragm carrier *h*. The knife edges are preferably held toward their bearings by screws *y*, *z*, with interposed springs. By arranging the knife edges in the above mentioned manner it will be seen that the contact of the needle with the record while the latter is running tends to press the knife edges more firmly upon their bearings instead of tending to lift them against the resistance of springs as occurs in the usual form of instrument. High notes are by this means more satisfactorily reproduced since chattering of the bearings is avoided, and the adverse effect of any scratching which may occur is greatly reduced in that the vibrations caused by scratching are not transmitted to the diaphragm. In place of the coil springs shown plate springs may be used if desired.

In the further part of the invention relating to the resilient mounting of the element which carries the diaphragm upon the member 3, over which slips the portion *k* of the sound pipe *a*, I form a concentric circular groove 4, and in the adjacent face of the back plate 5 of the diaphragm carrying member *h* I form a similar groove 6. Within the groove 4 of the member 3 are two projections 7 which extend into the groove 6 of the adjacent member 5. Similar projections but in different positions are formed in the groove 6 of this member 5. These may conveniently take the form of screws 8, which pass through suitable slots in the members 3. These screws are preferably surrounded by a sleeve 9 of resilient material such as rubber. In the grooves 4 and 6 are spring buffers 10 such as rubber. The projections 7, on the member 3, bear against the one set of ends of the buffers 10 or the like, while the screws 8 on the other member 5 act as buttresses for the other ends

of the buffers 10. The two members, 3 and 5, are clamped together face to face by a ring 11, or the like, so that they cannot move toward or away from one another although they may have some small rotary movement relatively to one another against the resistance of the resilient buffers 10. In consequence of this device when the needle is in use a certain amount of yieldingness is afforded to the needle carrying member 5 in a circumferential direction about an axis passing centrally through or parallel with the diaphragm 12, although movement of the needle carrying member 5, in the direction which the needle tends to move in deflecting the diaphragm 12, is provided.

In constructing a diaphragm according to this invention a disk of wood 12 is provided some distance within its periphery with a circular concentric flange, 13, or ridge, which prevents warping of the diaphragm by atmospheric changes and the like. The portion of the disk 12, within the ridge or flange 13, is preferably made somewhat thicker than the rest of the diaphragm. It is found that a wooden diaphragm of this character may be used for a long period without warping and the sounds reproduced by it are of an exceedingly mellow tone. Instead of employing wood, however, for the diaphragm, other non-metallic material or compositions, such as "Gallalith" (which consists of carbon, milk and potato or the like) may be used.

It will be seen that many modifications may be made in the method of carrying this invention into effect without in any way departing from the spirit of the same.

What I claim as my invention and desire to secure by Letters Patent, is:—

In a sound reproducing instrument the combination of a needle carrier; a bar carried by said carrier and provided with a bearing at each end; abutments on opposite sides of said bar with which said bearings contact, said bearing and abutments being so arranged that the action of the traveling record on the needle will tend to force each bearing into a firmer contact with its abutment; a spring for each bearing tending to force the same into contact with its abutment; means for adjusting the tension of said spring; and a diaphragm coacting with said carrier provided with a thickened central portion and a flange extending out from said portion, substantially as described.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

HENRY GEORGE WIEDER.

Witnesses:

ALFRED G. BRATTON,
E. LAWRENCE H. ELLIOTT.

E. E. CLEMENT.
 METHOD OF RECORDING AND REPRODUCING SOUNDS OR SIGNALS.
 APPLICATION FILED NOV. 14, 1905. RENEWED MAR. 22, 1910.

1,011,322.

Patented Dec. 12, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

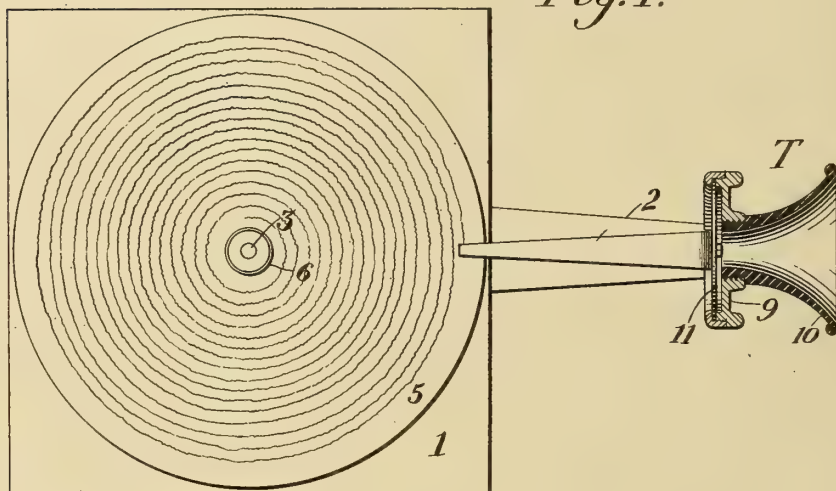
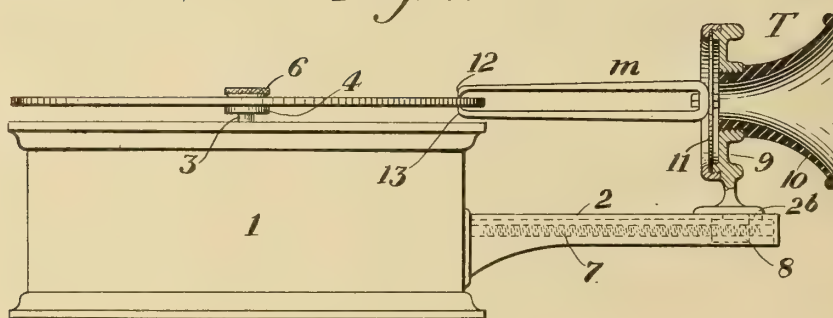


Fig. 2.



Witnesses
H. F. Lowenstein.
James A. Marr

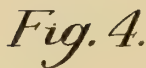
Inventor
Edward E. Clement

METHOD OF RECORDING AND REPRODUCING SOUNDS OR SIGNALS.

1,011,322.

Patented Dec. 12, 1911.

2 SHEETS—SHEET 2.



James A. Marr

Edward E. Glunz

UNITED STATES PATENT OFFICE.

EDWARD E. CLEMENT, OF WASHINGTON, DISTRICT OF COLUMBIA.

METHOD OF RECORDING AND REPRODUCING SOUNDS OR SIGNALS.

1,011,322.

Specification of Letters Patent.

Patented Dec. 12, 1911.

Application filed November 14, 1905, Serial No. 287,328. Renewed March 22, 1910. Serial No. 551,012.

To all whom it may concern:

Be it known that I, EDWARD E. CLEMENT, citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Methods for Recording and Reproducing Sounds or Signals, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to methods of recording and reproducing sound, and has for its object the improvement of such methods.

Briefly stated the invention consists in the use of a steel disk or cylinder upon which a magnetic spiral record is traced with the variations due to speech or other sound extended laterally thereon.

The recorder may be either a permanent magnet or an electromagnet and the reproducer is preferably an electromagnet connected to a telephone receiver.

By the use of my method it is possible to make a uniform trace and produce a maximum magnetic effect. The disadvantage of previous methods has been that they depend upon variations in the magnetic strength, so that no matter how strong the electromagnets employed, the reproduction would be weak because it would represent only the variations.

A form of apparatus with which my invention may be practiced is illustrated in the accompanying drawings in which—

Figure 1 is a plan view of the device with a permanent magnet for the recorder, parts being shown in section. Fig. 2 is a side view of the same with parts in section. Fig. 3 is a side view of the same with an electromagnetic recorder. Fig. 4 is a side view of the device showing the magnetic reproducer, with its circuit connections.

Referring to the drawings 1 represents a box or casing with any suitable driving mechanism, such as a clock train, which forming no part of my invention is not shown. The main arbor or driving shaft 3 of said mechanism projects vertically from the casing 1 and is provided with an annular collar 4 on which a steel disk 5 is adapted to rest. The disk 5 is secured for rotation by a screw cap or thumb nut 6 which engages the shaft 3 and presses against the upper face of said disk 5.

Connected to the clock train or other driv-

ing mechanism, so as to be driven a partial revolution for every revolution of the shaft 3, is a lateral screw shaft 7. The screw-threaded portion of the shaft 7 engages a bifurcated and threaded lug 8 which projects through a slot 2^a in the top 2 and carries the shell 9 of the recorded T provided with the usual mouth-piece 10 and diaphragm 11, which in this instance stands at right angles to the disk 5. The slot 2^a is provided with button-hole openings 2^b, which permit ready removal of the lug 8 from engagement with the screw shaft 7. Rigidly secured to the diaphragm 11 is a permanent magnet M having one pole 12 in engagement with the upper face of the disk 5, and the other pole 13 in engagement with the disk 5 immediately below the pole 12, so that the lines of magnetism will be directly through the plate.

In Fig. 3 I have shown an electromagnet 14 energized by a source of current X, and provided with a soft iron core 15 through which extends a rod 16 bearing against the disk 5, and connected to the diaphragm. A frame 19 is secured to the shell 9 and supports the magnet 14 in proper relation to the disk 5.

In the operation of the recording device the shaft 3 is given motion in the proper direction and the message or signal delivered to the diaphragm 11 so as to vibrate it, thus moving the magnet back and forth over the disk, which having a rotary motion receives a magnetic trace. The recorder being fed steadily forward by the screw 7, makes the trace a spiral.

For reproducing, the spiral trace may be caused to give motion mechanically to a light magnetic body attached to a thin diaphragm after the manner shown in Figs. 1 and 2, or an electromagnet reproducer may be employed as shown in Fig. 4, this method being preferred. In Fig. 4 the electromagnet 20 of the reproducer is shown connected in circuit with the telephone receiver R. This circuit connection may be arranged in any well known manner to produce the best and sharpest sounds in the receiver. The pole piece of the electromagnet is pointed or rounded and as the combined motion of the disk 5 and shaft 7 maintains the point of the magnet in the steady spiral line followed by the recorder, the magnetic trace in its recession from and approach to the

pole piece will produce varying magnetic effects in the magnet and thereby in the receiver.

The record may be removed from the disk by passing a broad-faced magnet over the surface or exposing it to an alternating field.

Various changes may be made in the apparatus employed without departing from the spirit of my invention among which I may mention the substitution of a cylinder for the disk, which, however, must be so arranged that the vibrations of the recorder will be at right angles to the direction of motion of the surface, or in other words that the tracer will move back and forth along one element of the cylinder.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. The method of recording and reproducing speech or signals, which consists in impressing upon a magnetizable body magnetic waves or undulations of constant strength in a path of variable direction and then subjecting a receiver to the influence thereof.

2. The method of recording and reproducing speech or signals, which consists in impressing a variable trace of constant magnetic condition upon a magnetizable body, and then reversing the action to reproduce the speech or signals.

3. The method of recording and reproducing speech or signals, which consists in subjecting a magnetizable body to the action of a magnet, varying the place of action so as to form on said body a varying trace of magnetism having approximately constant strength, and finally subjecting a second magnetizable body, which is connected to a sounding device, to the action of said wavy magnetic trace.

4. The method of recording and reproducing speech or signals, which consists in subjecting a magnetizable body to the action of a magnetic body, moving said magnetizable body relative to said magnetic body, moving said magnetic body relative to said magnetizable body, whereby the magnetic body is caused to leave a wavy trace of consequent poles of magnetism of constant strength, and finally subjecting a receiver

magnet to the action of said wavy trace of magnetism, whereby it will be caused to vibrate a diaphragm.

5. The method of recording and reproducing speech or signals, which consists in impressing upon a magnetizable body magnetic waves or undulations of substantially constant strength in a path of variable direction, exposing a relatively fixed magnetizable body to said undulations and causing the electromagnetic changes produced in said body to be electrically communicated to a telephone receiver.

6. The method of recording and reproducing sound which consists in (1) impressing upon a magnetizable record body a continuous magnetic trace of substantially constant strength but following an undulatory path corresponding to the undulations of the sound by which it is produced; (2) maintaining the pole of an electromagnet in close relation to the surface of the record body while producing relative motion or travel between the two so as to carry the magnetic trace past the magnetic pole continuously along a fixed line, whereby the several undulations of the magnetic trace will successively approach to and recede from the magnetic pole, producing electromagnetic changes therein and corresponding electrical changes in the magnet windings; and (3) translating said electrical changes through suitable apparatus into atmospheric waves corresponding to the original impressed undulations.

7. The method of recording sound which consists in causing sound waves to effect compound relative movement between complementary magnetic bodies, one of which is at a higher magnetic potential than the other so as to produce thereon a continuous magnetic record of substantially constant strength or intensity, extending in a path having undulations corresponding to the undulations of sound by which it was produced.

In testimony whereof I affix my signature in presence of two witnesses.

EDWARD E. CLEMENT.

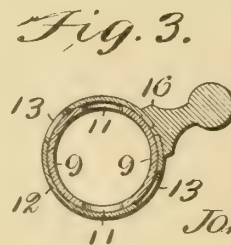
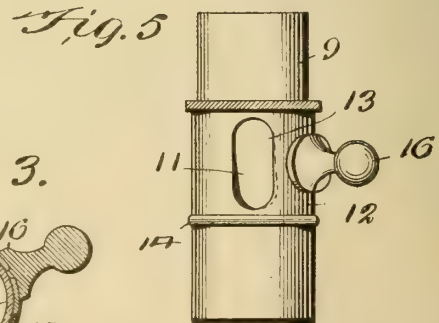
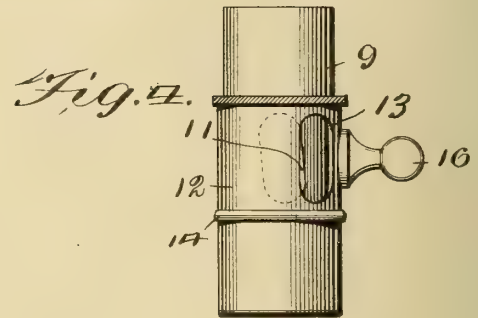
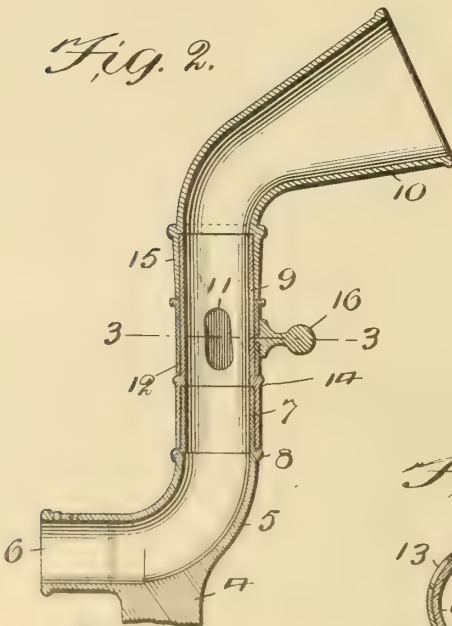
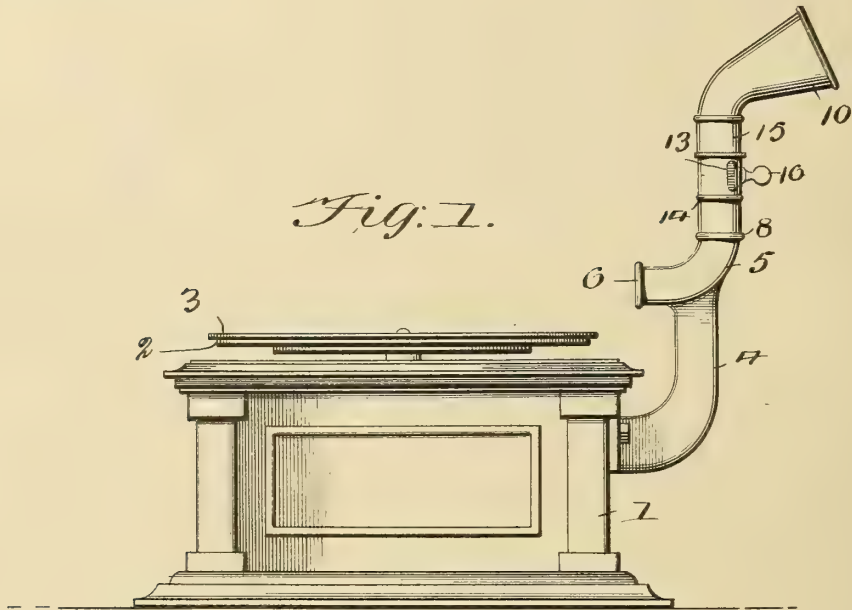
Witnesses:

HUGH M. STERLING,
JAMES H. MARR.

J. C. ENGLISH.
TALKING MACHINE.
APPLICATION FILED JULY 7, 1905.

1,011,419.

Patented Dec. 12, 1911.



WITNESSES:
T. E. Barry
Edw. W. Vaile

INVENTOR
John C. English
BY *James L. Little*
ATTORNEY.

UNITED STATES PATENT OFFICE

JOHN C. ENGLISH, OF CAMDEN, NEW JERSEY.

TALKING-MACHINE.

1,011,419.

Specification of Letters Patent.

Patented Dec. 12, 1911.

Application filed July 7, 1905. Serial No. 268,615.

To all whom it may concern:

Be it known that I, JOHN C. ENGLISH, a citizen of the United States, and a resident of the city of Camden, State of New Jersey, have invented certain new and useful Improvements in Talking-Machines, of which the following is a full, clear, and complete disclosure.

My invention relates to talking machines, and particularly to those parts of talking machines known as the sound reproducing and sound conveying apparatus, and has for its object to provide means for modifying the quantity of the sound reproduced by the talking machine.

In talking machines such as herein shown and described it is well known that the intensity of the vibration of the diaphragm of the reproducing apparatus is always substantially constant and variations thereof cannot be obtained by manipulation of the sound box, record, or record carrier.

My invention supplies means in connection with the sound conducting portions of the reproducing apparatus which will enable the quantity of the sound passing there-through to be varied at the will of the operator.

Briefly my invention comprises the combination with a sound conducting tube of a talking machine, of means for reducing the amplitude of the vibrations passing longitudinally therethrough, by allowing free lateral communication between the interior and the exterior of the tube, whereby a part of the energy of the vibrations within the tube will escape and be absorbed by air surrounding the tube, and consequently the amplitude of the vibrations within the tube will be diminished, resulting in a diminished intensity of the sound issuing longitudinally from the tube.

In the accompanying drawing illustrating one form of my invention: Figure 1 is a side elevation of the main parts of the usual parts of the usual talking machine showing my invention applied thereto. Fig. 2 is a longitudinal sectional view of the sound conducting mechanism employed in this form of my invention on a somewhat enlarged scale; Fig. 3 is a transverse sectional view taken substantially upon the line 3-3, of Fig. 2; and Figs. 4 and 5 are detail views of the parts of my invention detached from the other parts of the talking machine and

showing the parts in two different positions relatively.

Referring to the drawing, the numeral 1 indicates any suitable form of casing for the talking machine motor above which is rotatably mounted a turntable 2 carrying the record 3. Attached to one side of the casing 1 is an arm or bracket 4 which carries at its upper end a curved tube or elbow 5. This tube or elbow 5 is adapted to be connected at its lower end 6 with any well known or suitable form of sound conducting tube and reproducing mechanism. The upper end of the elbow 5 is slightly reduced in diameter as indicated at 7 and provided with a bead or shoulder 8. Upon the reduced portion 7 and telescoping therewith is mounted a short section of tubing 9, the upper end of which is adapted to telescope with the smaller end of the amplifying horn or support 10 therefore or other continuation of the sound conducting means. The wall of the tubular section 9 is provided with one or more openings as indicated at 11, which are preferably elongated and slightly inclined. The elongation of the holes 11 gives a large opening in the tubular section 9 without unnecessarily weakening the same and the incline of the same permits of great variations in the volume of sound transmitted longitudinally out through the amplifying horn 10. About the tubular section 9 is placed a sleeve or short section of tubing 12 which has an opening or openings 13 therein corresponding to the opening or openings 11 in the short section of tubing 9, but arranged longitudinally of the sleeve instead of in the inclined direction. The said sleeve 12 is preferably located upon the tubular section 9 by means of a shoulder or bead 14 and by the lower end of the telescoping portion of the support 10 for the amplifying horn as indicated at 15, and is provided with a projection 16 forming a handle for rotating the same about the tube 9.

In the operation of the talking machine, when it is desired to obtain the full value of the sound produced by the reproducing mechanism the sleeve 12 is placed in such a position about the tubular portion 9 that the openings 11 are closed by said sleeve, but when it is desired to reduce the sound, the sleeve is rotated so that the openings 13

register to a greater or less extent with the openings 11, thereby allowing the column of air within the sound conducting tube to vibrate freely transversely to a greater or less extent. This, of course, reduces the transmitted longitudinal vibration of the column of air within the tube and softens the sound emerging from the amplifying horn. This result is effected, as will be observed, without in any way muffling or rendering indistinct the tones and sounds given off by the reproducing mechanism, the modification thereof being simply one which reduces the volume of the sound without any detrimental effect.

I preferably employ two opposite openings in the sound conducting tube and its corresponding sleeve, but I do not wish to be limited to this precise arrangement for other arrangements may be adopted which will produce the same effect and allow a more or less free transverse vibration of the column of air without interfering with the progress of the waves longitudinally of said column.

It is obvious that my invention may be embodied in talking machines using either records having a vertically undulating groove or records having laterally undulating grooves of even depth.

What I claim is:—

1. In a talking machine, the combination with a sound conveying tube having a reduced end, of a sleeve rotatably mounted on said end, and means telescoping over the said end to hold said sleeve in position longitudinally, said tube and said sleeve being

perforated to permit a part of the sound carried by said tube to pass through said sleeve.

2. In a talking machine, the combination with a sound conveying tube having a reduced end forming an annular shoulder, of a second tube telescoping over said reduced end, and having a reduced outer end, a sleeve rotatably carried by the reduced end of said second tube, and means telescoping over the end of said second tube for holding said sleeve in place, said sleeve and said second tube being perforated to permit a part of the sound carried by said tube to pass through said sleeve.

3. In a talking machine, the combination with a sound conveying tube, having a reduced upper end forming an annular shoulder, of a second tube telescoping over said reduced end and resting upon said shoulder, and having an upper reduced end forming an annular shoulder, an amplifying horn telescoping over the upper end of said second tube and a sleeve rotatably carried by said second tube and confined between the shoulder and the lower end of said amplifying horn, said sleeve and said second tube being perforated to permit a part of the sound, carried by said tube, to pass through said sleeve to modify the intensity of sound issuing from said amplifying horn.

In witness whereof I have hereunto set my hand this sixth day of July, A. D., 1905.

JOHN C. ENGLISH.

Witnesses:

HENRY COBB KENNEDY,
ALEXANDER PARK.

~~275~~
275, 420

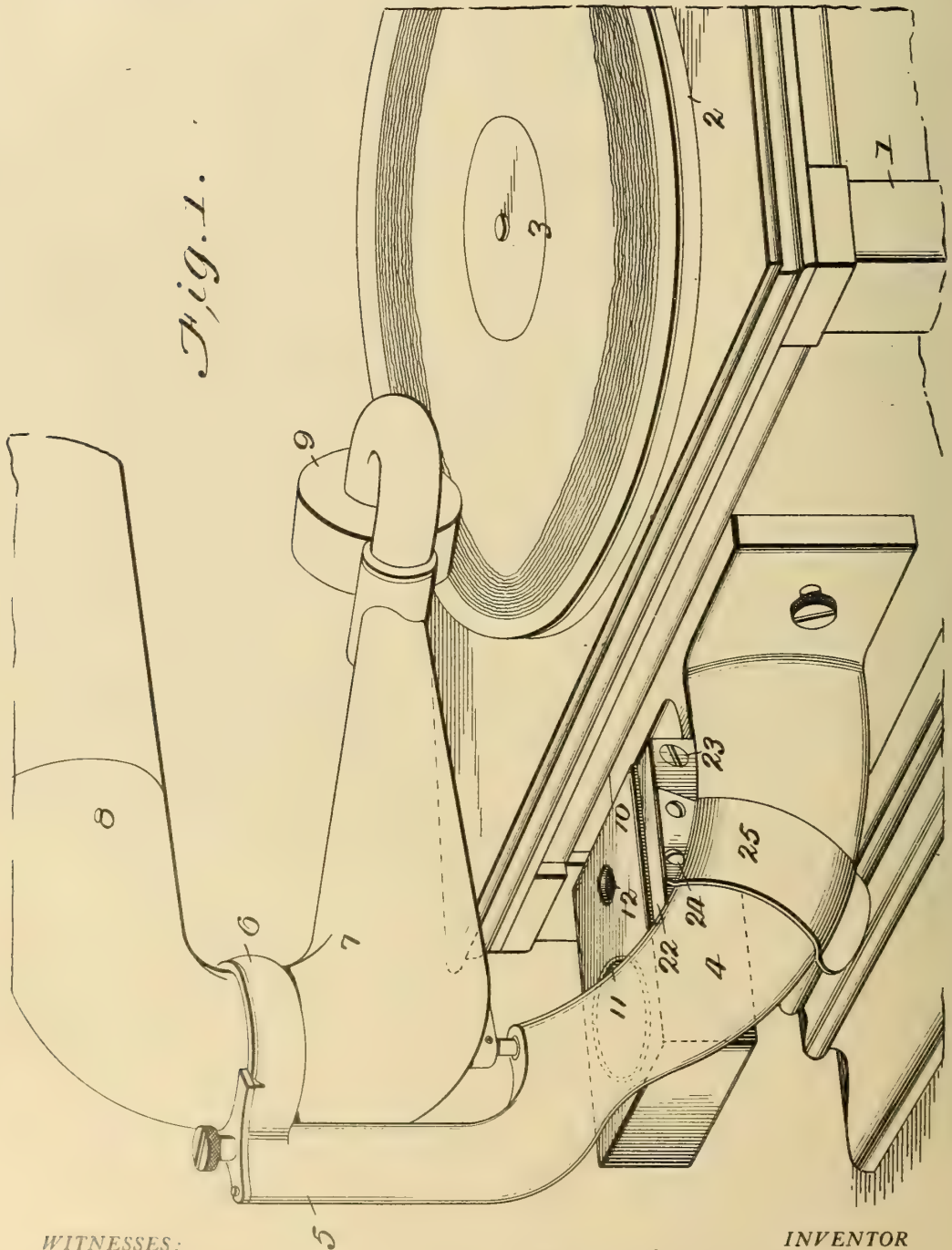
J. C. ENGLISH.
 NEEDLE RECEPTACLE FOR TALKING MACHINES.
 APPLICATION FILED MAY 8, 1906.

1,011,420.

Patented Dec. 12, 1911.

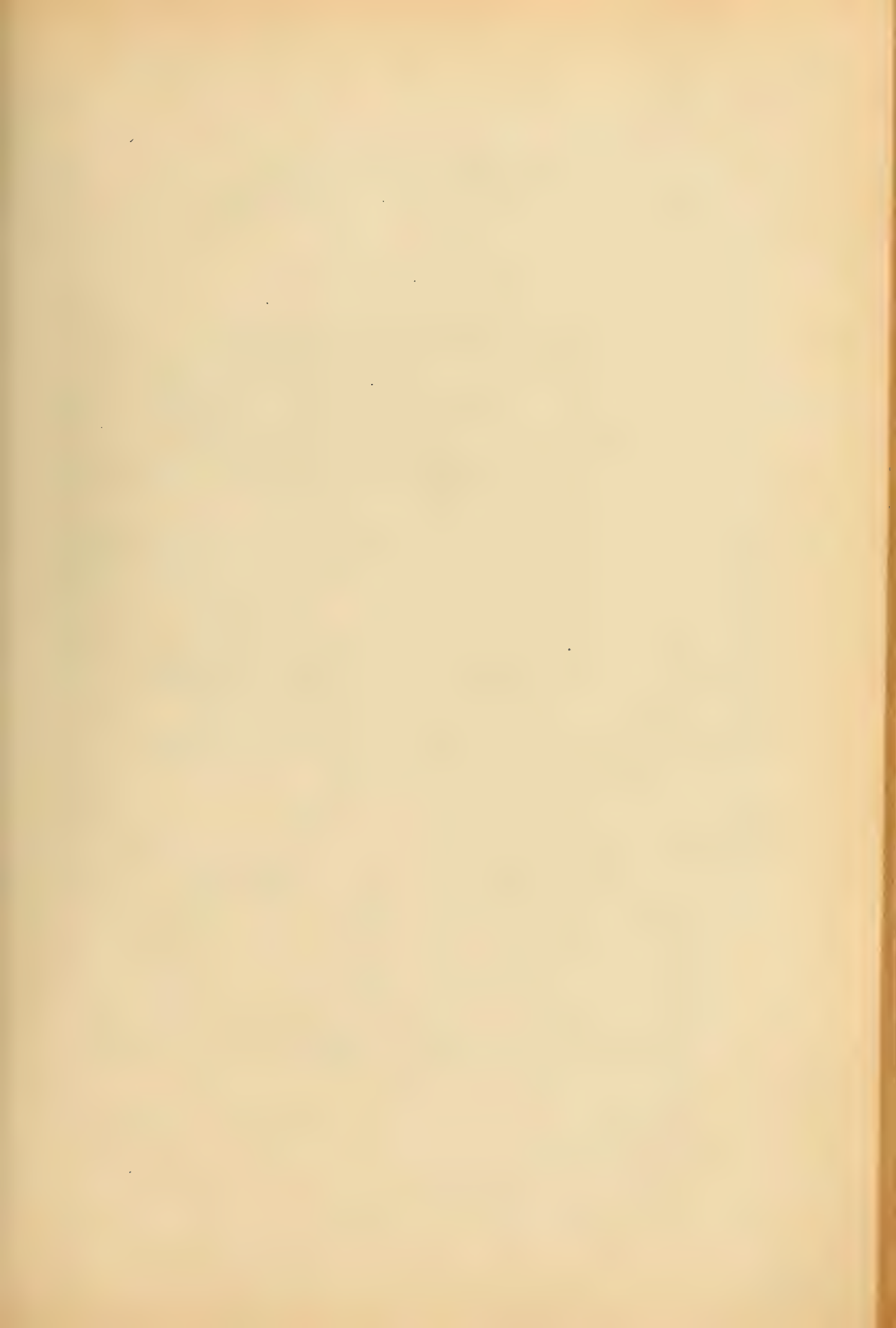
2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:
F. C. Barry
W. D. Holden

INVENTOR
John C. English
 BY *Horace C. Kelly*
 ATTORNEY.

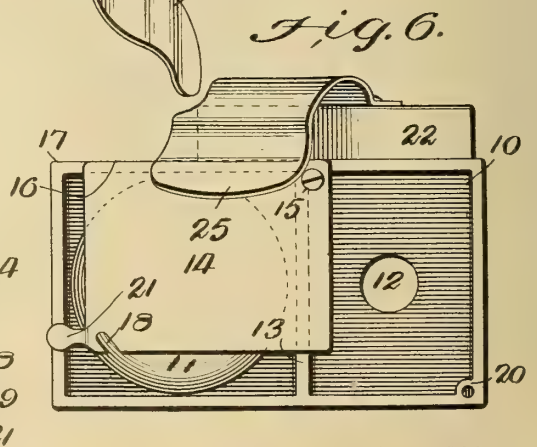
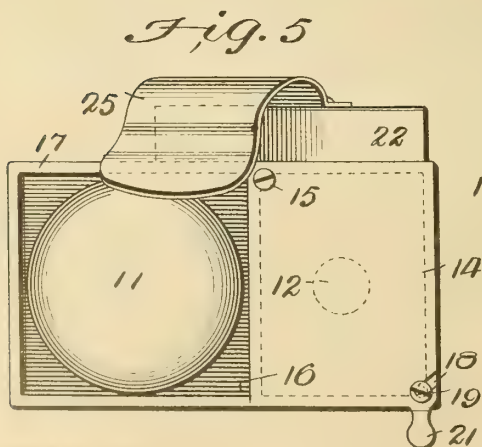
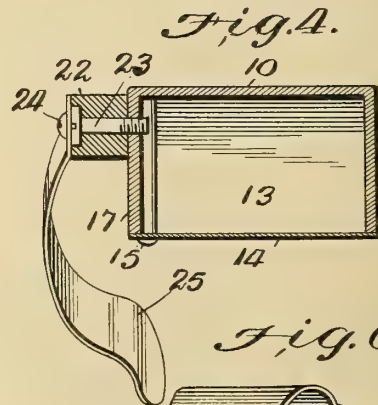
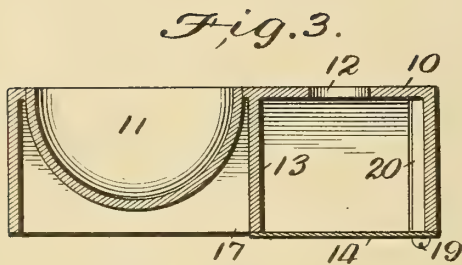
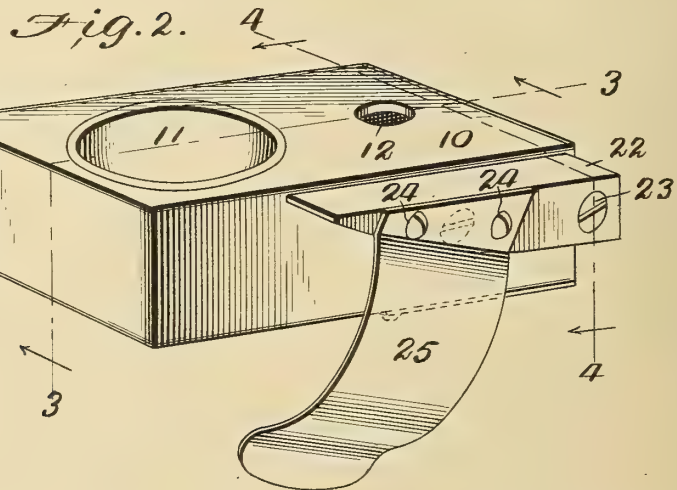


J. C. ENGLISH.
 NEEDLE RECEPTACLE FOR TALKING MACHINES.
 APPLICATION FILED MAY 8, 1906.

1,011,420.

Patented Dec. 12, 1911.

2 SHEETS—SHEET 2.



WITNESSES:
J. E. Barry
W. H. Holden

INVENTOR
John C. English
 BY *Horace Bell*
 ATTORNEY.

UNITED STATES PATENT OFFICE.

JOHN C. ENGLISH, OF CAMDEN, NEW JERSEY, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

NEEDLE-RECEPTACLE FOR TALKING-MACHINES.

1,011,420.

Specification of Letters Patent.

Patented Dec. 12, 1911.

Application filed May 8, 1906. Serial No. 315,772.

To all whom it may concern:

Be it known that I, JOHN C. ENGLISH, a citizen of the United States, and a resident of the city of Camden, State of New Jersey, have invented certain new and useful Improvements in Needle-Receptacles for Talking-Machines, of which the following is a full, clear, and complete disclosure.

My invention relates to receptacles for holding needles, and particularly to receptacles adapted to be attached to talking machines.

One of the objects of my invention is to construct a needle receptacle which will facilitate the separate storage of used and unused needles, and which may be easily attached to a talking machine in such a position as to be at all times accessible to the operator.

Further objects of my invention are, to provide a needle receptacle adapted to be attached to the supporting bracket of a talking machine; to provide a needle receptacle having a readily accessible compartment for the unused needles, and also a compartment for worn needles, and having convenient means for the removal of worn needles; and to provide other improvements as will appear hereinafter.

In the accompanying drawings, Figure 1 is a perspective view showing a needle receptacle constructed in accordance with this invention, secured in convenient position on a talking machine; Fig. 2 is a perspective view of said needle receptacle detached; Fig. 3 is a central vertical longitudinal section of said needle receptacle taken on the line 3—3 in Fig. 2; Fig. 4 is a transverse vertical sectional view of said receptacle taken on the line 4—4 in Fig. 2; Fig. 5 is an inverted plan view of said receptacle showing the swinging door or closure for the receptacle in its closed position; and Fig. 6 is a view similar to Fig. 5, but showing the swinging door in its open position and the locking screw removed.

Referring to the drawings, one embodiment of this invention is shown attached to the usual talking machine comprising the usual motor cabinet, above which revolves the usual turn-table 2, and upon which is carried the sound record 3. Attached to one side of the motor cabinet 1 is the usual supporting bracket 4, having an upper end 5, rigidly attached to which is a ring 6. Jour-

naled to swing in a horizontal plane in said ring is the hollow arm portion 7 of the amplifying horn. The bell portion 8 of said horn is journaled to the upper end of said ring, and is also swung in a horizontal plane. To the outer extremity of the hollow arm 7 is attached the sound box 9, which co-operates with the record.

The needle receptacle is preferably rectangular in shape and may be made of brass or any other suitable metal or material. Within one end of the top plate 10 of the receptacle is located an open basin or compartment 11 which is preferably substantially semi-spherical in order that the unused needles which it is adapted to hold, may be readily drawn therefrom. The invention, however, is not confined to a semi-spherical compartment for this purpose, as the same may be of any configuration, but preferably should have a continuous uninterrupted surface from one edge to the other in order that the needles will meet no obstructing crevices or corners in being drawn therefrom. The other end of the top plate 10 of the receptacle contains an aperture 12 opening downwardly into a closed compartment, the inner side of which is formed by a transverse vertical partition 13, and the underside of which is open forming an outlet adapted to be closed by a swinging horizontal cover or door 14. This door 14 is rectangular in shape to conform to the shape of the compartment of which it forms the bottom, and is journaled on a vertical screw 15, which passes loosely through one of its inner corners, and is threaded upwardly into the casing, thus enabling the door to be swung in its own plane, so that its inner edge 16 will be flush with the outer surface of the inner side 17 of the casing, as shown in Fig. 6. For limiting the closing movement of the cover 14 and securing it in its closed position, said cover is provided with a slot 18 in the edge thereof, arranged to engage a locking screw 19, which is threaded upwardly in a socket 20 in the casing. Said swinging cover 14 is provided adjacent to the slot 18 with a handle 21, formed integral therewith for swinging the cover upon its axis.

For attaching the receptacle to the supporting bracket 4 of the talking machine, a bar 22 is secured by means of screws 23 and 24—24 to the inner side 17 of the casing,

the upper surface of the bar being substantially flush with the upper surface of the top plate 10. The under side of this bar is curved to conform to the upper side
 5 of the bracket 4 of the talking machine, as shown in Fig. 1. Secured also by the screws 24—24 to the outer side of the bar is a downwardly depending oblique spring plate 25, which is adapted to be sprung
 10 around the supporting bracket 4 to hold the needle receptacle against the cabinet 1 and the supporting bracket 4.

From the above description, it is apparent that the needle receptacle may be readily at-
 15 tached or detached from the talking machine, and at the same time is so situated when attached thereto that the fresh needles are readily accessible when desired for use, the open compartment 11 being filled with
 20 a suitable number of the same.

It may be observed that in changing needles, the worn needle, by reason of the fact that the aperture 12 in the compartment for worn needles is adjacent to the open
 25 compartment 11, and between the sound box and said open compartment, may be quickly dropped through said aperture 12, and the hand of the operator quickly passed along to the compartment 11, from which an un-
 30 used needle may be taken. When the compartment or closed receptacle beneath the aperture 12 becomes filled or partly filled with worn needles, to remove the same it is merely necessary to swing the under cover
 35 14, as heretofore described, to its position shown in Fig. 6, thus causing all the worn needles to drop into any suitable receptacle or on to any suitable support as desired. Of
 40 course, it is obvious that the aperture 12 may be dispensed with, and the entire compartment for the worn needles be left open at the top. The under cover 14 may also be dispensed with, and needles emptied from the casing through any other opening.

45 While I have described a specific structure of needle receptacle, the details of which possess merits in themselves, yet I do not wish to confine myself to the exact receptacle herein illustrated or described,
 50 but reserve the right to utilize any other form of receptacle which will perform a

similar function, provided that the same is within the scope of my invention, as set forth in the appended claims.

Having thus described my invention, what 55 I claim as new and desire to protect by Letters Patent of the United States is:—

1. A needle receptacle for talking machines arranged to be detachably supported on a talking machine bracket, a bar carried 60 by said receptacle for maintaining it substantially horizontal on said bracket, and a spring clasp coöperative with said bar for maintaining said receptacle thus supported.

2. A needle receptacle for talking machines, arranged to be detachably supported on a talking machine bracket, a bar projecting laterally from said receptacle for main- 65 taining said receptacle substantially horizontal on said bracket, and a spring clasp 70 coöperative with said bar for detachably retaining said receptacle on said bracket with said bar engaged therewith.

3. A needle receptacle for talking machines, provided with a member attached to 75 said receptacle and having its under side arranged to engage the upper surface of a supporting bracket of a talking machine, and a spring plate secured to said member and adapted to clamp the same to said 80 bracket.

4. A needle receptacle for talking machines, a bar attached to one side of said receptacle having its under side extending obliquely of the receptacle to conform to the 85 upper surface of a supporting bracket of a talking machine, and a spring plate secured to said bar for attaching said receptacle to said bracket.

5. A needle receptacle for talking machines, a bar attached to said receptacle and having its under side shaped to conform to the upper surface of a supporting bracket of a talking machine, and a spring plate se- 90 cured to said bar for attaching said recep- 95 tacle to said bracket.

In witness whereof, I have hereunto set my hand this seventh day of May, A. D. 1906.

JOHN C. ENGLISH.

Witnesses:

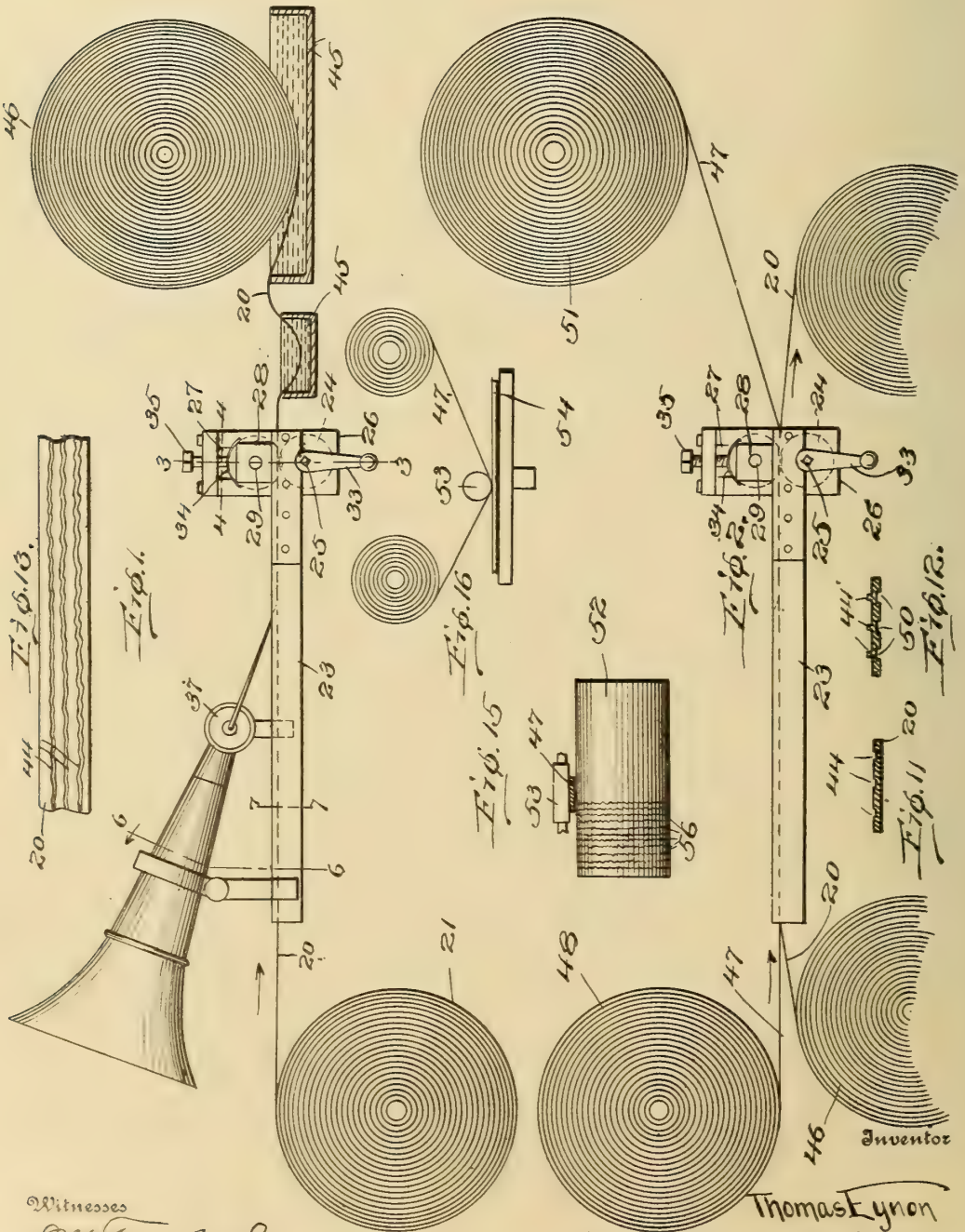
WILLER A. HOLDEN,
 ALSTON B. MOULTON.

T. EYNON.
 PHONOGRAPH RECORD AND PROCESS OF MAKING THE SAME.
 APPLICATION FILED APR. 15, 1909.

1,011,421.

Patented Dec. 12, 1911.

2 SHEETS—SHEET 1.



Witnesses
 J. M. Fowler Jr.
 L. D. Morrill.

Thomas Eynon
 By Mason F. Wick Lawrence,
 Attorney

T. EYNON.

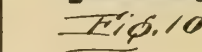
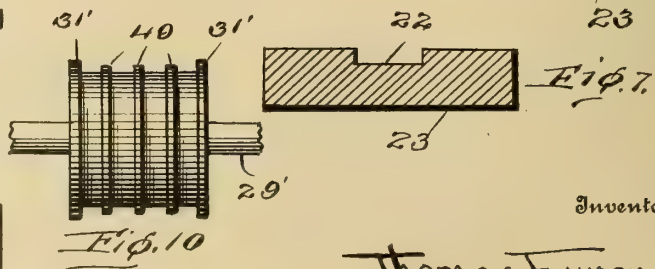
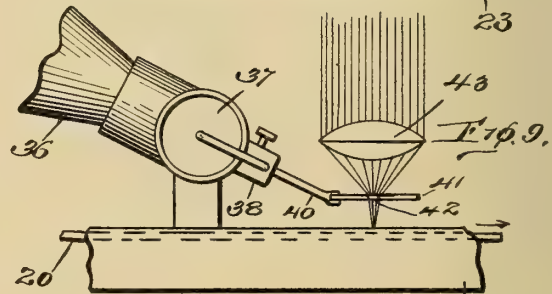
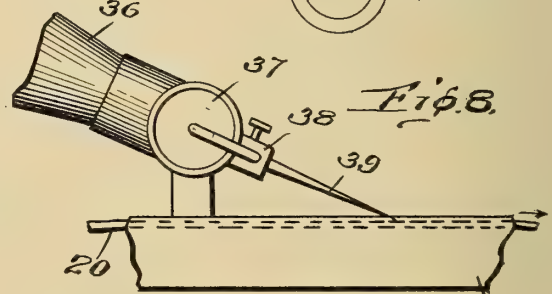
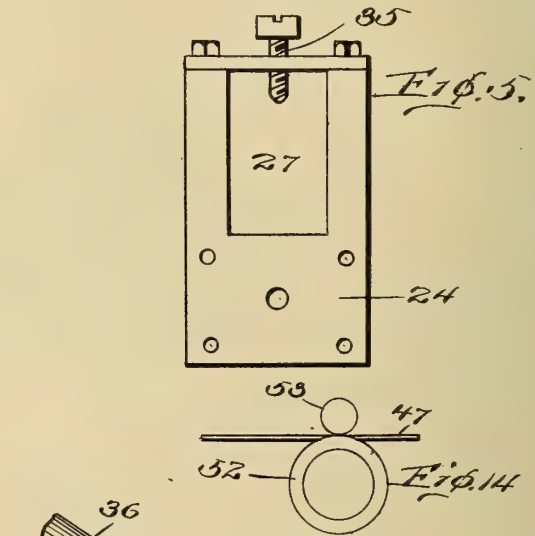
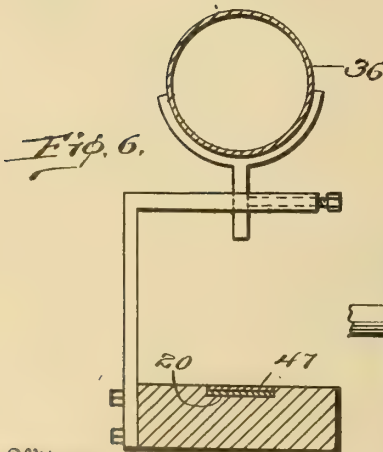
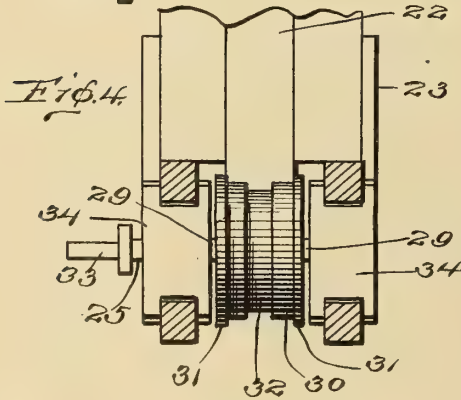
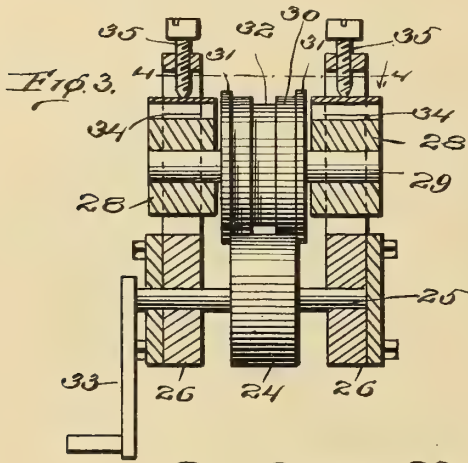
PHONOGRAPH RECORD AND PROCESS OF MAKING THE SAME.

APPLICATION FILED APR. 15, 1909.

1,011,421.

Patented Dec. 12, 1911.

2 SHEETS—SHEET 2.



Inventor.

Thomas Eynon

By Mason Finck Lawrence,

Attorneys

Witnesses
J. M. Fowler Jr.
L. L. Morrill.

UNITED STATES PATENT OFFICE.

THOMAS EYNON, OF CHICAGO, ILLINOIS.

PHONOGRAPH-RECORD AND PROCESS OF MAKING THE SAME.

1,011,421.

Specification of Letters Patent.

Patented Dec. 12, 1911.

Application filed April 15, 1909. Serial No. 490,044.

To all whom it may concern:

Be it known that I, THOMAS EYNON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Phonograph-Records and Processes of Making the Same; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to phonograph records or records for any similar mechanism for the reproduction of sounds here grouped under the head of phonographs, and it is to be understood that the term "phonograph" is intended to embrace any form of talking or sound-reproducing mechanism employing wax or similar records.

An object of the present invention is to produce means whereby an unlimited number of records may be produced from a master record by transferring the record produced upon the master record to the wax record.

A further object of the invention is to employ a hard metal master record coated for the purpose of production only with a thin layer of wax, the wax being removed at places by the action of the needle of the phonograph and the parts uncovered by such action being etched out of the metal by ordinary etching process whereby the record is produced in the metal which is later transferred to the wax record.

A further object is to provide a hard metallic record and to employ a soft metal to produce a negative from the hard metal record, which negative is adapted to reproduce the record upon a wax body.

A further object of the invention is to provide means for employing a pencil of heat rays for removing the wax from the coated metal instead of employing a metallic needle for mechanically removing such wax.

A further object of the invention is to provide an apparatus adapted to employ the wax covered hard metal and to move the same in position for being acted upon by the phonograph and later to transfer the record from such metal to a soft metal, from which the record is finally produced.

With these and other objects in view, the

invention comprises certain novel constructions, combinations and arrangements of parts, as will be hereinafter fully described and claimed.

In the drawings:—Figure 1 is a view in side elevation of an apparatus for carrying into effect the present invention, and showing the wax covered metal ribbon being operated upon by the phonograph. Fig. 2 is a view in side elevation of the mechanism showing the completed master record ribbon being run through a machine when associated with a soft metal ribbon to produce the negative. Fig. 3 is a vertical, sectional view through the rolls of the devices as on line 3—3 of Fig. 1. Fig. 4 is a top plan view of the rolls with part of the frame-work broken away as on line 4—4 of Fig. 1. Fig. 5 is a view of part of the frame-work in side elevation. Fig. 6 is a transverse, sectional view through the bed and horn supporting member as on line 6—6 of Fig. 1. Fig. 7 is a transverse, sectional view of the bed as taken on line 7—7 of Fig. 1. Fig. 8 is an enlarged view in side elevation of the phonograph needle engaging the master record ribbon. Fig. 9 is a conventional view in side elevation showing the employment of the sun's rays and a burning glass to remove the wax from the master record ribbon. Fig. 10 is a view in side elevation of a roller employed for transferring the record from the master record to the negative. Fig. 11 is a view in transverse section of a master record tape etched with three records. Fig. 12 is a view in transverse section of one of the negatives with three records transferred thereto. Fig. 13 is a view in plan of either the master record ribbon shown at Fig. 11 or the negative shown at Fig. 12. Fig. 14 is a view in end elevation of a conventional means for transferring the record from the negative to a wax cylinder. Fig. 15 is a view in side elevation of the transferring means shown at Fig. 14. Fig. 16 is a conventional view of an apparatus for transferring the record from the negative to a disk record.

Like characters of reference indicate corresponding parts throughout the several views.

In carrying out the present invention a tape or ribbon of hard metal, preferably steel, as shown at 10, is employed, the same being coated with a very thin coating of wax of any approved form, and wound upon

a roll or drum 21, from which it is moved through a groove 22 in the bed 23. Such movement is accomplished in any approved manner as by a roller 24 carried upon a shaft 25, journaled in the frame-work 26, rigidly connected with the bed 23, in any approved manner. The frame-work 24 is bifurcated as at 27 and bearing blocks 28 mounted therein movable vertically. Within the bearing blocks 28 a shaft 29 is journaled carrying a roller 30 having flanges 31 adapted to engage upon the opposite ends of the roller 24 and with a circumferential groove 32, so formed that the roller 30 will bear only upon the edges of the ribbon 20. The shaft 25 is provided with any approved means for rotating the same here shown as the crank arm 33, so that as the crank arm 33 is rotated the roller 24 rotates therewith and rotates the roller 30, which is held in frictional engagement by means of springs 34 and tension screws 35.

Above the bed 23 a horn, shown conventionally at 36, is mounted, having the usual and ordinary diaphragm 37 carrying a socket member 38 shown in detail at Figs. 8 and 9, and carrying either a needle 39 engaging the upper surface of the ribbon 20 or an arm 40 having a refractory disk 41 secured thereto provided with a central aperture 42 above which a burning glass 43 is mounted in such manner that the rays concentrated by such burning glass are directed through the aperture 42 upon the wax surface of the ribbon 20. It will be seen that the movement of the diaphragm responsive to sound waves within the horn 36 will move the needle 39 or the arm 40 and disk 41 transversely of the ribbon 20, so that the engagement of such needle 39 or the rays from the burning glass 43 impinging upon the wax surface of the ribbon will cause the wax film to be removed from such ribbon in a waved line as shown conventionally in Fig. 13 at 44.

It is obvious that the position of the needle or disk 41 relative to the transverse extend of the ribbon 20 may be varied so that more than one record may be produced upon the ribbon, if desired, and as shown at Fig. 13, it being understood, however, that the number of records so produced is not limited and may vary from one to any number that the width of the ribbon will accommodate.

After the ribbon 20 passes between the rollers 24 and 30 with the record formed in the soft wax of the film, it is passed through a vat or bath 45, shown at Fig. 1, such vat containing etching acid, whereby the surface of the metal not covered by the wax is etched out, after which the ribbon is run through a vat or bath 45', containing a washing material which will neutralize the acidity of the etching bath, which may also remove the wax or the wax may be removed

later by heating the ribbon, as found most convenient. As the ribbon runs through the bath 45' it is preferably wound upon a roll 47 for storage purposes.

After the wax has been removed from the ribbon it is found that the record produced on the wax film has been faithfully reproduced in the surface of the metal itself, as shown at 44 in Fig. 11, so that the record is in the form of grooves of irregular serpentine shape formed in the surface of the metal.

It is desirable to produce the record for ordinary use in the surface either by wax cylinder or wax disk, but as the groove in the ribbon 20 would produce upon the wax an upstanding rib, it is found necessary to produce a negative. For this purpose a roll 46 is placed as shown at Fig. 2, and the etched ribbon 20 again run through the groove 22 of the bed 23. Now, however, the horn 36 is preferably removed, and the soft metal ribbon 47 is unwound from a roll 48 and passed through the groove 22, simultaneously with the ribbon 20. Now the roller 30 is removed from the frame-work, and a roller as shown at Fig. 10, substituted having a plurality of circumferential ribs 49, the end portions 31' corresponding with the ends 31 of the roller 30. The roller shown at Fig. 10 is made to bear with a considerable degree of pressure upon the soft metal ribbon 47 at those places where the record on the ribbon 20 is disposed. With the device as shown herein with three records upon the ribbon 20, a roller with three of the ribs 49 will be employed whereby in use three grooves 50 are formed in the contacting surface of the soft metal ribbon 47 forcing contiguous portions of the soft metal into the grooves 44' as shown at Fig. 12, after which such soft metal ribbon is wound upon a convenient roll as 51, for storage purposes. It will be understood that the soft metal ribbon provided with the upstanding ribs 44' will be a faithful negative of the record produced in the metal ribbon 20. Now, if the negative 47 is passed over the surface of a wax cylinder 52, as shown conventionally at Figs. 14 and 15, and at the same time tension exerted thereon in any approved manner as by a tension roller 53, the record as produced in the wax film of the ribbon 20 will be reproduced in the surface of such wax cylinder. If a wax disk is to be employed as shown at 54, in Fig. 16, with a tension roller 55, the record will likewise be transferred from such ribbon 47 to the wax disk. It will be understood, of course, that mechanical means must be employed for properly moving the negative 47 or the disk or roller 54 or 52 relative to each other, so that the record will be produced on such cylinder, for instance, as shown at 56 in Fig. 15. Any of the usual and ordinary mechanism for

moving the parts now employed upon phonographs may be used to advantage in carrying out this part of the invention.

What I claim is:—

5 1. The process of producing a phonograph record consisting in passing a coated metal plate adjacent to a vibrating diaphragm provided with means for removing a portion of the coating, passing such metal
10 through an etching bath, transferring the record formed by the etching to a soft metal, and transferring the negative from such soft metal to a wax record.

2. The process of producing a phonograph
15 record consisting in passing a coated metal tape adjacent to a phonograph diaphragm having means for removing the surface coating, passing the ribbon through an etching bath, removing the coating, passing the ribbon
20 under pressure in association with a soft metal ribbon to produce a negative, passing the negative under pressure upon the surface of a plastic record.

3. The process of making a phonograph
25 record consisting in passing a coated hard metal ribbon adjacent a phonograph dia-

phragm, removing part of the surface coating by means which is carried by the diaphragm, passing the coated ribbon through
30 an etching bath, passing the etched ribbon under pressure in association with a soft metal ribbon, and passing the soft metal ribbon in association with the surface of a plastic record.

4. The process of producing a phonograph
35 record consisting in passing a coated metal ribbon adjacent to a vibrating diaphragm having means for removing the coating, passing the ribbon through an etching bath adapted to etch out the metal where exposed,
40 removing the coating from the ribbon, passing the etched ribbon in contact with a soft metal ribbon under pressure to produce a negative, and employing the negative to impress a positive upon a plastic surface.

In testimony whereof I affix my signature in presence of witnesses.

THOMAS EYNON.

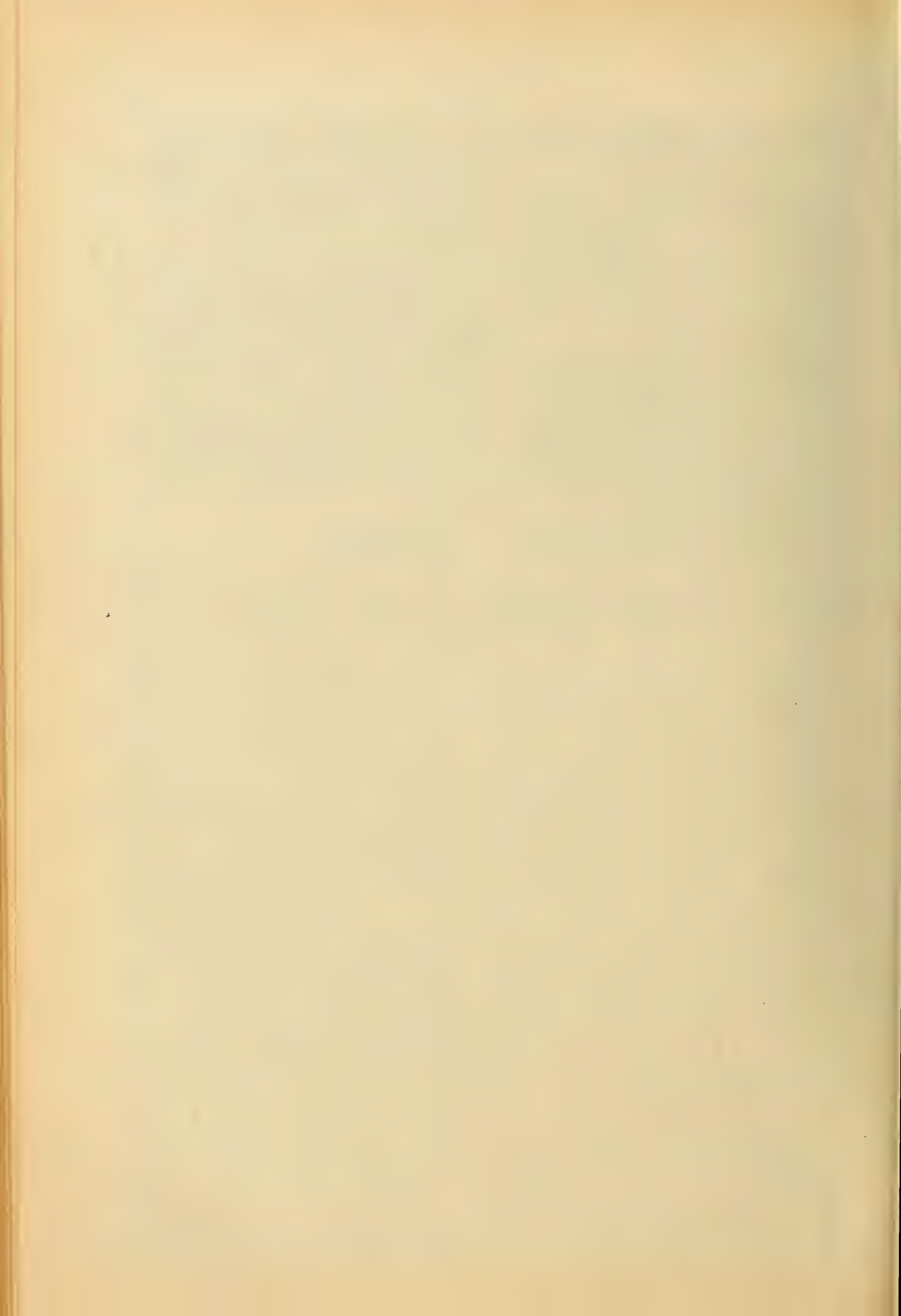
Witnesses:

C. J. SCHRADE,

C. E. MARTIN,

WILLIAM FRUMEL.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."



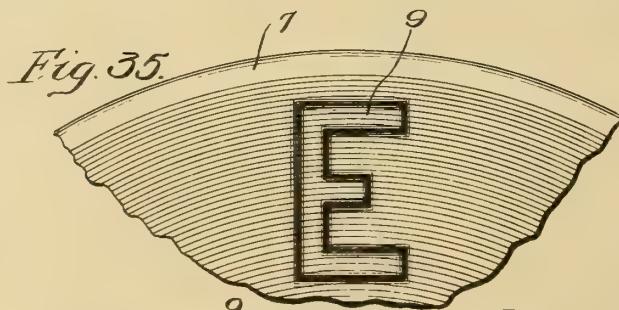
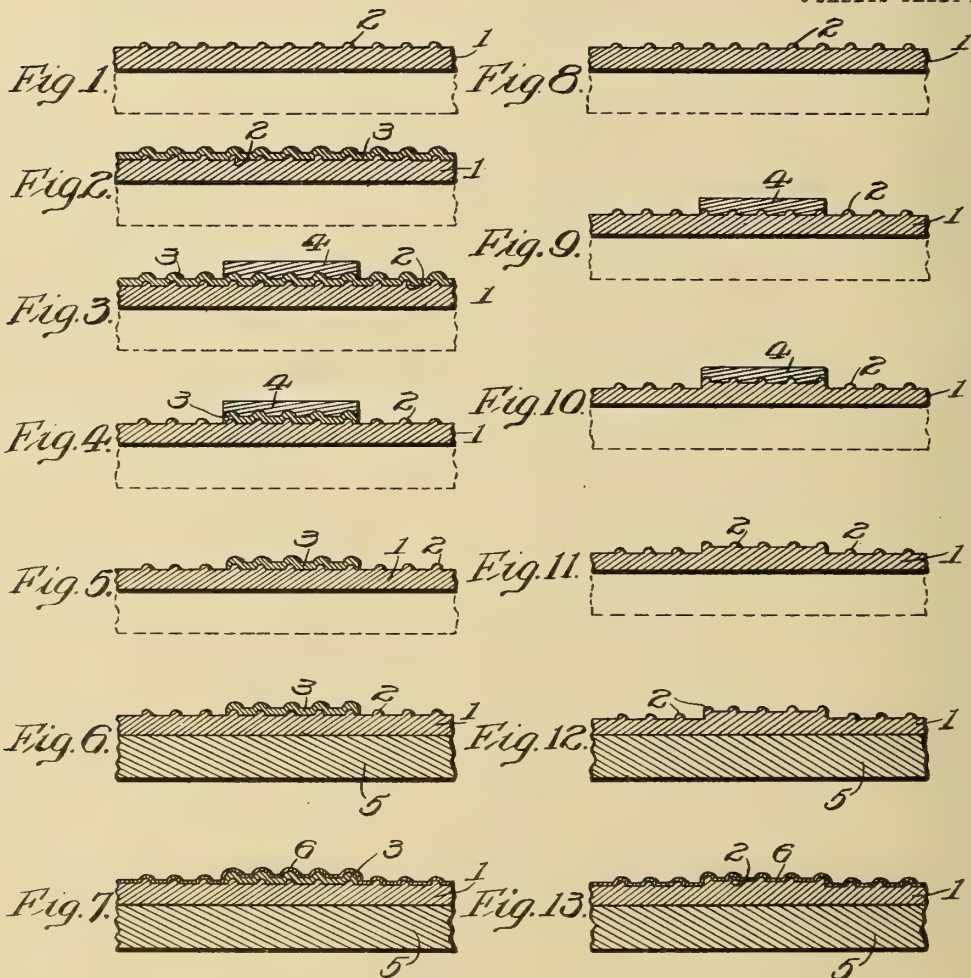
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J. W. OWEN.
 METHOD OF MAKING SOUND RECORDS AND THE MATRICES FOR FORMING SOUND RECORDS.
 APPLICATION FILED MAY 4, 1908.

1,011,838.

Patented Dec. 12, 1911.

3 SHEETS—SHEET 1.



WITNESSES
F. J. Hartmann.
Alexander M. Moulton

BY

INVENTOR
 James W. Owen.

1 time test.

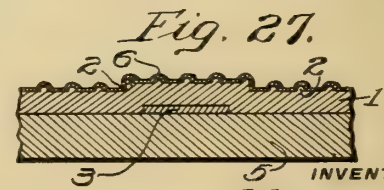
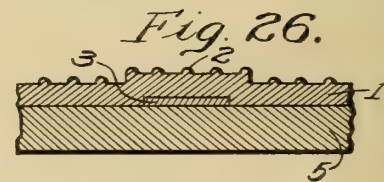
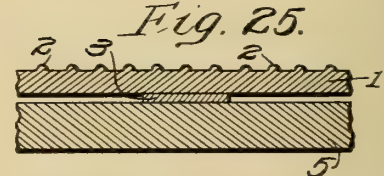
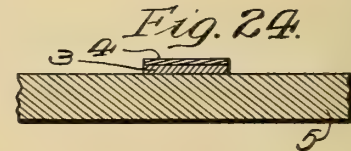
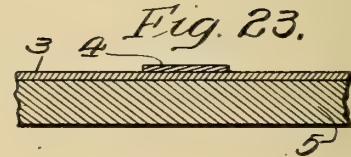
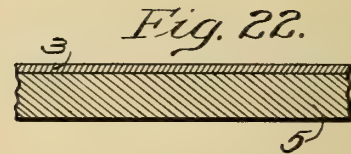
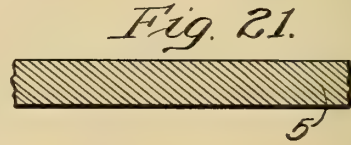
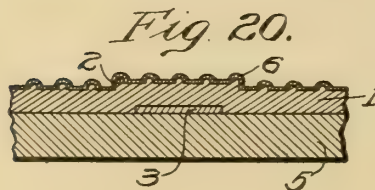
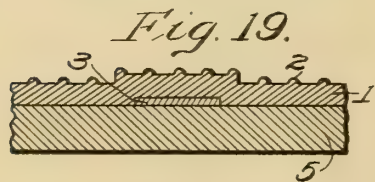
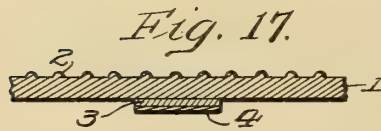
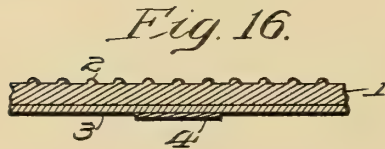
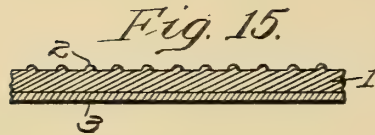
ATTORNEY

J. W. OWEN.
 METHOD OF MAKING SOUND RECORDS AND THE MATRICES FOR FORMING SOUND RECORDS.
 APPLICATION FILED MAY 4, 1908.

1,011,838.

Patented Dec. 12, 1911.

3 SHEETS—SHEET 2.



INVENTOR
 James W. Owen.

WITNESSES
 F. J. Hartman.
 Albert B. Moulton.

BY

Home Text.

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J. W. OWEN.
 METHOD OF MAKING SOUND RECORDS AND THE MATRICES FOR FORMING SOUND RECORDS.
 APPLICATION FILED MAY 4, 1908.

1,011,838.

Patented Dec. 12, 1911.
 3 SHEETS—SHEET 3.

Fig 28.



Fig 29.



Fig. 30.



Fig. 31.



Fig. 32.

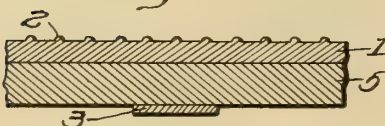


Fig. 33.

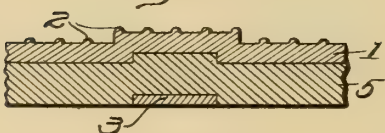
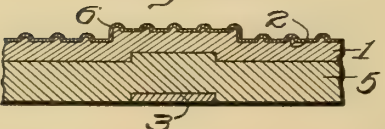


Fig. 34.



INVENTOR

James W. Owen.

BY

1 June 1912.

ATTORNEY

WITNESSES
 H. Hartmann.
 Albert J. Moulton.

UNITED STATES PATENT OFFICE.

JAMES W. OWEN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

METHOD OF MAKING SOUND-RECORDS AND THE MATRICES FOR FORMING SOUND-RECORDS.

1,011,838.

Specification of Letters Patent.

Patented Dec. 12, 1911.

Application filed May 4, 1908. Serial No. 430,658.

To all whom it may concern:

Be it known that I, JAMES W. OWEN, a citizen of the United States, and a resident of the city of Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented certain new and useful Improvements in the Method of Making Sound-Records and the Matrices for Forming Sound-Records, (Case B,) of which the following is a full, clear, and exact disclosure.

The object of my invention is to produce a commercial sound record which cannot easily be duplicated or dubbed without either impairing or injuring the sound record formed thereon, or indicating the source of origin of the original record.

A further object of my invention is to produce a sound record or a matrix from which sound records may be pressed having identification marks, by which I mean marks distinct from the record groove or ridge located upon the recorded portion of the record.

A further object of my invention is to form the said marks in the matrix, from which records may be pressed, by an etching process.

In the drawings forming a part of this specification in which like characters are used to designate the same parts throughout the various views, Figures 1 to 7 indicate diagrammatically, various steps formed in carrying out my invention; Figs. 8 to 13 indicate in a similar manner a modification of my process; Figs. 14 to 20 indicate a further modification of my process and Figs. 21 to 27 another modified method of forming marks upon the recorded surface of the matrix and Figs. 28 to 34 a still further modified method of carrying out my improved method. Figs. 35 and 36 are fragmentary plan and sectional views respectively of a sound record formed in accordance with my invention.

In carrying out my method I first make a master record in the ordinary way and then I form a shell or a negative from said master record by any of the well known methods of electrodeposition. The next step is to form in this negative or shell or upon the matrix formed therefrom identification marks, as above described and I may make such marks in a variety of ways.

Referring first to Figs. 1 to 7, Fig. 1 is a sectional view of a negative or shell 1, 55 which has been formed from the master record as above indicated. This shell has the sound waves formed as a narrow ridge 2 on the face of the shell, the same being a reverse of the sound record formed in the 60 master record. The shell 1 is preferably made of copper and is formed by copper plating the master record in any electro-bath. The shell 1 is first given a coating of a suitable material which will be readily 65 effected by a mordant which will not violently attack the copper shell. I may form this coating by depositing over the face of the shell a thin coating of zinc by the electroplating process. This coating of zinc is 70 very thin and the ridges forming the record groove will plainly appear on the face of the zinc coating. This step is illustrated in Fig. 2, in which 3 indicates the zinc coating. I then form upon the zinc coated surface 75 of the shell letters, words, marks or other characters which it is desired to have appear upon the face of the finished matrix by coating a part of the surface of the zinc with an etching-ground, as plainly illus- 80 trated in Fig. 3. The letters or marks may be formed by painting or stenciling a portion of the zinc surface with a material which will resist the action of a mordant or the portions of the zinc surface which it is 85 desired to have appear as marks may be left unprotected while the surrounding portion of the zinc may be coated with the said etching-ground. The unprotected portion of the zinc is then eaten away or removed 90 and a part of the surface of the coated shell depressed by immersing the whole in a bath which will rapidly act upon the zinc coating but which will not materially affect the copper. A weak cold bath of sulfuric acid 95 may be used for this purpose and after having been immersed for a short time all the zinc will be removed from the surface of the copper shell except that which was protected by the etching ground, as illustrated in Fig. 4. The etching ground is then removed in any suitable manner as shown in Fig. 5, and the shell is united to a backing 5 in the usual manner by the sweating process, as illustrated in Fig. 6 and the whole 100 matrix so formed may be given a protecting

surface 6 of nickel, as shown in Fig. 7. In carrying out this process it is immaterial whether the backing 5 is united to the shell 1 at the first or at the end of the process, although I preferably unite it after the etching-ground has been removed, as above indicated.

My invention may also be carried out in the manner illustrated in Figs. 8 to 13, in which the shell 1 has applied to the recorded surface thereof the etching-ground 4, without first plating the shell with zinc, as illustrated in Figs. 8 and 9, the shell having a part of its surface thus protected is then immersed in a bath which will attack the copper and the whole unprotected surface is thus depressed for a slight distance, as shown in Fig. 10, after which the shell is removed from the bath and the etching-ground removed (Fig. 11), then backed up by uniting it to a suitable backing 5, as shown in Fig. 12, after which the whole may be given a suitable plating 6 of nickel to protect the surface from injury.

Instead of forming the letters or marks directly upon the face of the shell, as above illustrated and described, I may form the same upon the back of the shell, as illustrated in Figs. 14 to 20, in which Fig. 14 indicates the shell 1, the back of which may be provided with the zinc or other surface 3, as shown in Fig. 15. A part of the zinc surface may then be protected in like manner by a suitable etching-ground 4 (Fig. 16) after which it is immersed into a bath which will act upon the unprotected zinc coating as shown in Fig. 17. After the zinc surface has been sufficiently depressed or the unprotected portions completely removed by the action of the bath, the shell is taken out of the bath and the etching-ground removed in any suitable way. The shell is then placed upon a suitable backing 5 and united thereto under pressure as by the sweating process, whereupon the slightly projecting zinc surfaces will be pressed into the back of the shell with the result that the surface overlying the zinc coated portion will be raised slightly about the general surface of the record, as illustrated in Fig. 19, it being understood, however, that when the shell is united to the backing by the sweating process it is of course necessary to protect the recorded portion of the shell by interposing between the shell and the pressing plate a sheet of elastic protective material such as a sheet of asbestos, which will prevent the ridges on the shell from becoming injured and will allow the surface of the shell overlying the zinc coated portion of the backing to slightly yield and form the letters or marks on the surface of the shell. As in the previously described methods the matrix thus formed may be given a protective coating of nickel, as shown in Fig. 20.

In Figs. 21 to 27 I have shown a still further modification of my process in which the letters or marks are formed upon that surface of the backing which is adjacent to the shell. The backing is shown in Fig. 21, and upon the face of the backing I may deposit a thin coating of zinc, in the manner above described as shown in Fig. 2. A portion of the zinc surface is then protected by applying thereto a suitable etching-ground 4, as shown in Fig. 23, after which the unprotected portion of the zinc surface may be eaten away by a suitable mordant, as shown in Fig. 24. The shell is then placed upon the backing as shown in Fig. 25, and united thereto under pressure, whereupon the zinc coated portions of the surface of the backing will present slight elevations in the face of the backing which will be pressed through the thin shell when the shell is united with the backing by the sweating process, thus forming the marks upon the recorded surface of the shell, as shown in Fig. 26. The finished matrix is shown as nickel plated in Fig. 27.

In Fig. 28 to 34 inclusive, I have shown a still further method of forming the marks upon the surface of the matrix. The backing shown in Fig. 28 is given a thin coating of zinc or other suitable material upon the back thereof, as illustrated in Fig. 29. Parts of the zinc, or otherwise coated backing, are protected by a suitable etching-ground 4, as shown in Fig. 30, and the parts of the coating not covered with the etching-ground are depressed in any suitable manner, as by immersing in a bath of weak sulfuric acid. This step is illustrated in Fig. 31. The shell or matrix 1 is then placed upon the face of the backing 5, as illustrated in Fig. 32, and the shell is united to the backing to solder the two said parts together under pressure, with the result that the projecting portions 3 on the back of the backing are pressed into the backing and through it, and also through the thin shell, so that that portion of the backing which presented a raised appearance, due to the thin deposit of zinc, or similar material upon the back thereof, appear upon the face of the shell, and, consequently upon the face of the matrix as slight elevations, as illustrated in Fig. 33. The whole may then be given a nickel plating, as in the previously described processes, this step being shown in Fig. 34.

A commercial record 7 may be formed from any of the matrices shown in Figs. 6, 12, 19, 26, or 33, or from the nickel plated matrices shown in Figs. 7, 13, 20, 27, or 34, with the result that the portions of the record groove 8 traversing the raised portion of the matrix will be slightly depressed below the general surface of the record forming marks, as at 9 Figs. 35 and 36, but the continuity of the groove or the depth or

width of the groove will not be materially changed where it traverses the said marked portions.

It is, of course, obvious that in these processes the portions of the zinc surface remaining after the shell has been subjected to the action of the mordant, as illustrated in Figs. 5, 11 and 18 or the zinc coating has been subjected to the action of the mordant, may represent either the marks or the surface surrounding the marks, in either case the same general characteristics being present, that is to say, a part of the effective surface of the face of the shell or a part of one of the adjacent surfaces of the shell or of the backing is in part depressed or in part elevated with respect to the other parts of the surface.

I prefer to form the marks upon the recorded surface of the matrix and consequently in the recorded surface of the record produced therefrom, as illustrated in the various views of the drawings and when I use the expression "recorded part or portion of the record" I mean the whole or any part of the surface of the tablet or of the matrix bounded by the beginning and the end of the record groove or ridge including any portion of the surface of the tablet or the matrix between the grooves or ridges or any portion of the surface, or sides, or tops, or bottoms of the grooves or ridges forming the sound record.

For convenience I call the marks which I have formed in the manner above described, "identification marks" but it is obvious that these marks may be of any desired form, shape or character, or they may be words or letters or may be provided to cause an ornamental effect in the face of the finished record any of which marks would fully serve to identify the record, as well as impart any other information which it is desired to incorporate into a record to the user of the record.

Commercial records may be pressed directly from the matrices, formed in the manner above described, or the matrices may be used as duplicate master records from which to produce, in any suitable manner, other matrices for the production of commercial records.

I have, in the above specification, described one manner in which the matrix or shell after first having been coated with a suitable etchable material, may be subjected to the action of the mordant, that is to say, by placing it in a suitable bath with certain portions of the coated surface protected from the action of the mordant by a suitable etching ground. My invention, however, is not limited to this exact method of carrying out my invention, for I fully contemplate other means of removing a portion of the coating. I may paint or stamp the letters or marks upon the zinc film or other coating by means

of a pad, or stamp, or brush, impregnated with cold sulfuric acid and water, or any other suitable etching reagent or mordant. In this case it may not be necessary to first protect any portion of the zinc or other coating with an etching ground, since the reagent above described will act very rapidly upon the coating of zinc and remove it without spreading it. It is also apparent that the film of zinc or other material is very thin and the zinc or other coated surface will have in it the same grooves or ridges as appeared in the uncoated matrix, and the grooves and ridges will be continuous and of substantially the same depth, or height, and width on the zinc surface as they have on the surface of the matrix beneath such coating. It is also to be observed that when the face of the shell or matrix is the portion to which the zinc or other coating is applied, the shell and backing may be united prior to such coating and also when the marks are formed upon the back of the backing, although usually it would be preferable to form the marks on the shell or the backing as might be desired before the same are united, since, in some instances, it would save one operation, and would further reduce the liability of injury to the record of the sound recorded.

Inasmuch as the coating is very thin, the elevations or depressions will be very slight and when commercial records are provided with the marks obtained by carrying out the above process, the stylus, in reproducing, will ride smoothly over the elevations, without producing any noise, due to such elevation or depression. In other words, the marks will not phonetically affect the stylus as it traverses the record groove.

While I have described various ways in which my invention may be put into practice, I do not wish to be construed as being limited to the exact steps or order of steps above set forth, since my invention contemplates a variation of processes in which a portion of the surface of the matrix is raised or depressed for the purpose of forming marks therein by an etching process, so long as such variations fall within the scope of the appended claims.

Having now described my invention what I claim and desire to protect by Letters Patent of the United States is:

1. The method of making a matrix with identification marks thereon, which consists in forming a shell, coating the recorded surface of said shell with a material capable of being etched, forming the desired marks on the said material with an etching ground, depressing that part of said material which is not protected, and backing said shell.

2. The method of making a matrix with identification marks thereon, which consists in forming a shell, coating said shell with a

metallic material, forming the desired marks on said material with a protective coating, depressing that part of said material which is not protected, and backing said shell.

5 3. The method of making a matrix with identification marks thereon, which consists in forming a shell, coating said shell with a material capable of being etched, forming the desired marks on the said material over
10 the recorded surface thereof with an etching-ground, depressing that part of the said material which is not protected, and backing said shell.

4. The method of making a matrix with identification marks thereon, which consists in forming the marks upon the matrix with an etching-ground, depressing that part of the matrix which is not protected by said etching ground, and backing up said matrix.

20 5. The method of making a matrix with identification marks thereon, which consists in forming the marks upon the recorded surface of the matrix with an etching-ground, cutting away the exposed surface of said
25 matrix by a suitable mordant, and backing up said matrix.

6. The method of making a matrix with identification marks thereon, which consists in forming the marks upon the recorded surface of the matrix with an etching-ground, cutting away the exposed portion of said surface by a suitable mordant, removing said etching-ground and backing up said matrix.

7. The method of marking a matrix, which consists in forming a shell, covering one side of said shell with a material capable of being etched, forming the desired marks in said material within the boundaries of planes passing substantially normal to the beginning and the end of the record groove with an etching-ground, and depressing the unprotected portion of said material.

8. The method of marking a matrix, which consists in forming a shell, covering one side of said shell with a material capable of being etched, protecting parts of the surface of said material, and depressing the unprotected parts of the surface of said material.

50 9. The method of forming a matrix which consists in covering one side of said matrix with a coating of zinc, protecting parts of said surface by forming the desired marks upon said surface within the area of the recorded portion of said matrix with an etch-

ing-ground, and etching the unprotected portion of said material.

10. The method of marking a matrix which consists in changing the relative heights of parts of the surface of said matrix within the area of the recorded portion thereof to form the desired marks by an etching process.

11. The method of making a matrix which consists in forming elevated marks upon one surface of said matrix within the area of the recorded portion of said matrix by an etching process, and backing up said matrix.

12. The method of making a matrix which consists in forming marks upon one surface of the matrix by a suitable etching-ground, subjecting the matrix to the action of a suitable mordant, and removing said etching ground.

13. The method of making a matrix which consists in forming upon one surface thereof the desired marks with a protective coating, depressing the unprotected portion of said surface, and backing up said matrix.

14. The method of marking a matrix which consists in coating the same with a metallic substance, and depressing parts of said substance.

15. The method of marking a matrix which consists in coating the same with an etchable substance, and depressing parts of said substance by a mordant.

16. The method of making a matrix which consists in forming a shell, coating said shell with an etchable material, changing the heights of parts of said substance, and backing said shell.

17. The method of marking a sound record matrix, which consists in coating the same with an etchable material, changing the heights of parts of said material by a mordant, and nickel-plating said matrix.

18. The method of marking a matrix which consists in coating the surface of the matrix with a material capable of being etched, forming the marks upon said surface with a suitable mordant, and uniting said shell to a backing.

In witness whereof I have hereunto set my hand this 2nd day of May A. D. 1908.

JAMES W. OWEN.

Witnesses:

ALSTON B. MOULTON,
ALEXANDER PARK.

1, 612, 250

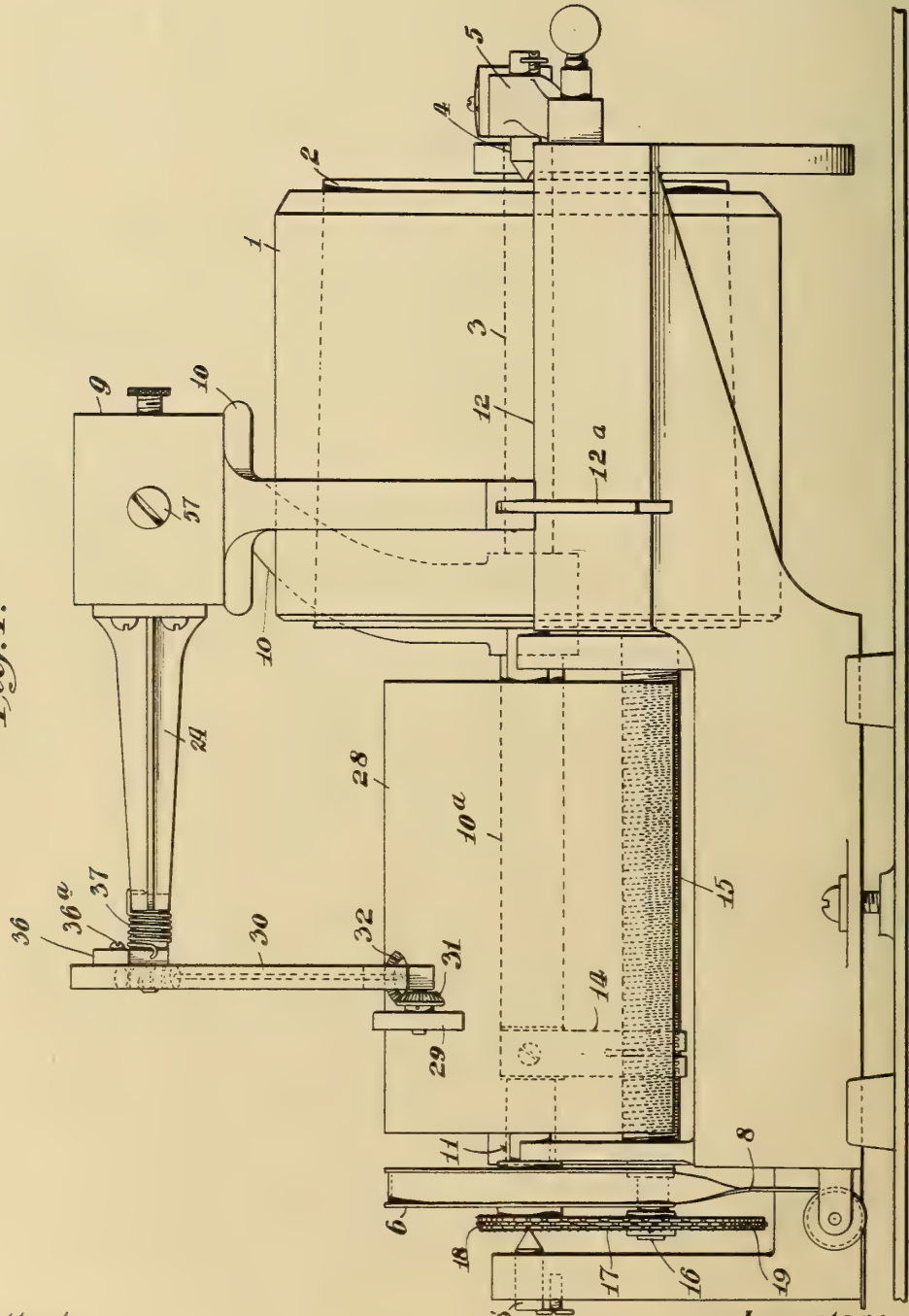
T. A. EDISON.
 RECORDING TELEPHONE.
 APPLICATION FILED SEPT. 15, 1905.

1,012,250.

Patented Dec. 19, 1911.

3 SHEETS—SHEET 1.

Fig. 1.



Attest:
Edgeworth Loring
De los Holden

Inventor:
 Thomas A. Edison
 by *Frank L. Ames* Atty.

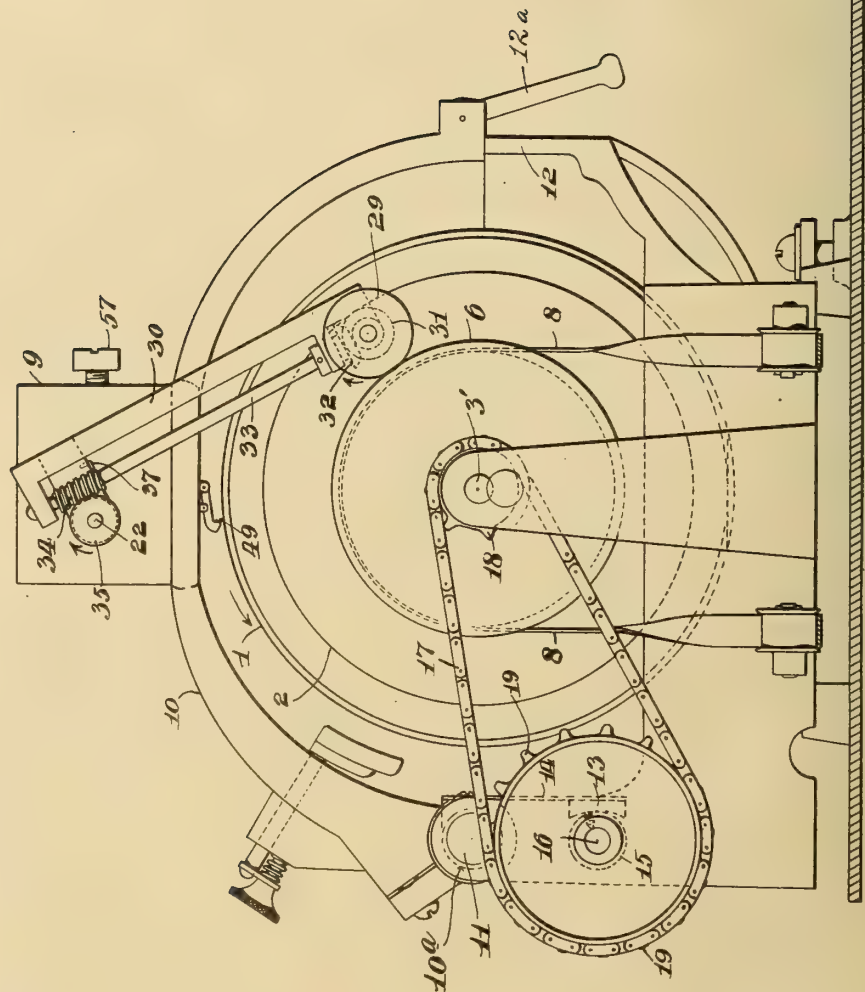
T. A. EDISON.
 RECORDING TELEPHONE.
 APPLICATION FILED SEPT. 15, 1905.

1,012,250.

Patented Dec. 19, 1911.

3 SHEETS—SHEET 2.

Fig. 2.



Attest:
Edgeworth Burns
 Delos Holden

Inventor:
 Thomas A. Edison
 by *Frank L. Spence* Att'y.



T. A. EDISON.
RECORDING TELEPHONE.
APPLICATION FILED SEPT. 15, 1905.

1,012,250.

Patented Dec. 19, 1911.

3 SHEETS—SHEET 3.

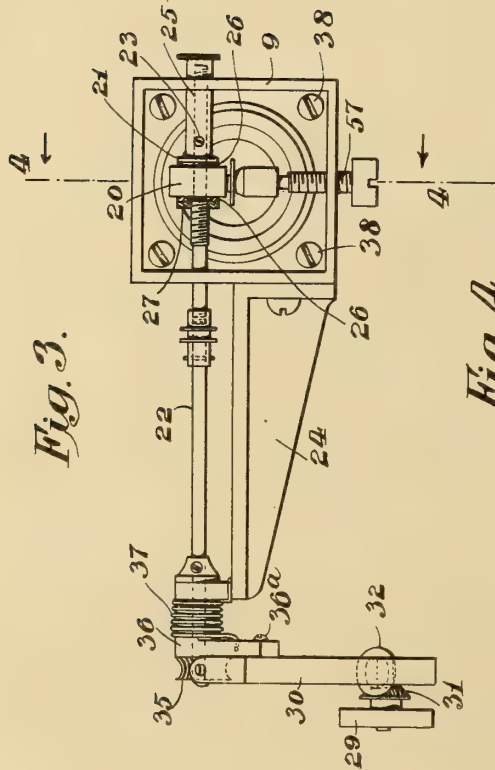


Fig. 3.

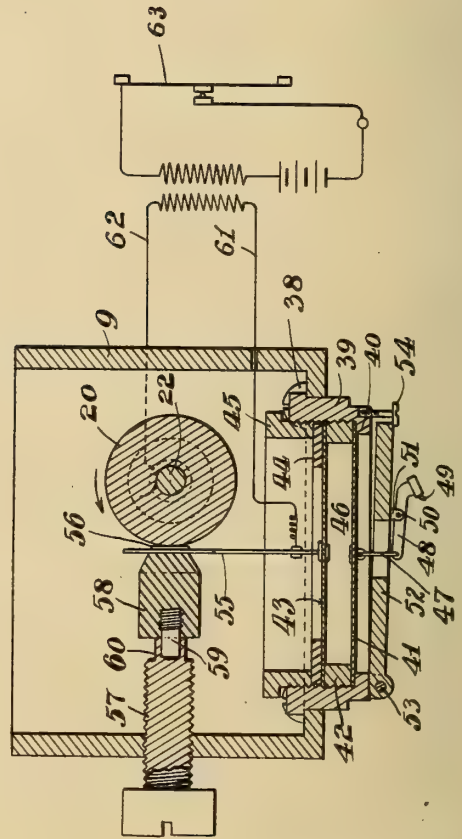


Fig. 4.

Attest:
Edgeworth Stevens
Deputy Notary

Inventor:
Thomas A. Edison
by *O. Frank L. Spence* Att'y.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, ORANGE, NEW JERSEY, ASSIGNOR TO
THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

RECORDING-TELEPHONE.

1,012,250.

Specification of Letters Patent.

Patented Dec. 19, 1911.

Application filed September 15, 1905. Serial No. 278,549.

To all whom it may concern:

Be it known that I, THOMAS ALVA EDISON, a citizen of the United States, residing at Llewellyn Park, Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Recording-Telephones, of which the following is a description.

My invention relates to telephones and has for its object the provision of means whereby the electrical vibrations or undulations which are received over the line may be recorded phonographically, whereby a record is formed which may be used in any ordinary phonograph, and the message repeated at any future time.

My invention relates more particularly to that form of a telephonic receiver described and shown in U. S. Letters Patent No. 221,957 granted to me on November 25, 1879, wherein a friction wheel formed of chalk or other suitable finely divided non-conducting material or porous body having capillary pores, is moistened with a suitable solution such as caustic alkali and a friction member such as a flat spring is pressed upon the chalk with a considerable pressure, the said spring being connected to a suitable diaphragm and the friction wheel being slowly rotated. The line wire is connected so that the current passes through the spring, frictional contact and friction wheel and causes the amount of friction between the friction member and friction wheel to vary in response to the electric waves or undulations, thereby throwing the diaphragm into vibrations corresponding thereto.

The present invention has for its object the application of such a telephone receiver to mechanism whereby the mechanical vibrations of the diaphragm thus produced may be utilized to produce a phonographic record in the form of a helical or spiral groove and more particularly the supporting of the friction wheel and diaphragm on a traveling carriage, and the driving of said wheel from a stationary motor used also for driving the carriage.

Reference is hereby made to the accompanying drawing forming part of this specification and in which—

Figure 1 is a front elevation illustrating the telephonic receiver and recording mechanism; Fig. 2 is an end elevation of the same; Fig. 3 is a detail plan view of the

telephonic receiver and a portion of the mechanism for driving the friction wheel; Fig. 4 is a section on line 4—4 of Fig. 3; and shows also the electrical connections.

In all the above views corresponding parts are designated by the same reference numerals.

The recording surface may be a cylinder 1 of suitable material for receiving a phonographic record and the mechanism for supporting and rotating said cylinder may be similar to the parts of an ordinary phonograph comprising a tapered mandrel 2 on which the cylinder 1 is held by frictional engagement and carried by a shaft 3 supported at its end by pivot pins 3' and 4, the latter being carried by an end plate 5, said shaft being driven by means of a pulley 6 and belt 8 driven from any suitable source of power, such as a spring or electric motor.

The telephonic receiver comprises a body 9 mounted upon a traveling carriage which consists of an arched member 10 whose rear end is clamped to a sleeve 10^a sliding on a rod 11, and whose forward end rests upon a straight edge 12, a lift lever 12^a being provided for elevating said end. The arm 10 and sleeve 10^a are given a progressive movement toward the right, Fig. 1, by a feed nut 13 carried by a spring arm 14 secured to the sleeve 10^a and engaging a screw 15 carried by or integral with a shaft 16 driven from the main shaft 3 by means of a chain 17 passing over sprockets 18 and 19. The receiver also comprises a friction wheel 20 of chalk or other suitable material, carried on a driving shaft 22, which is journaled in the walls of the body 9 and a bracket 24 secured thereto. A sleeve 25 having a collar 21 is secured to the shaft 22 by a set screw 23. Washers 26 are placed on each side of the wheel 20 and the whole clamped against the collar 21 by a nut 27 threaded on the shaft 22 (see Fig. 3).

The friction wheel driving mechanism comprises a cylindrical drum 28 which is fixed to the shaft 3 and rotates therewith. A drive roller 29 is journaled at one end of a swinging arm 30 and carries a bevel gear 31 which meshes with a similar gear 32, carried at the lower end of the shaft 22, which is journaled in the arm 30. The upper end of the shaft 22 is provided with a worm 34 which engages a worm wheel 35 on the end of the shaft 22. The arm 30 is

rigidly secured to a block 36 (as by a screw 36^a) and said block is mounted on the shaft 22 so as to permit the latter to freely rotate. In order to provide a good frictional driving contact between the roller 29 and drum 28, a coil spring 37 is arranged between the block 36 and bracket 24 and the ends thereof engage the said block and bracket respectively, thus pressing the roller 29 firmly against the drum 28. It will be observed that as the carrier arm 10 travels toward the right (Fig. 1), the roller 29 will at all times bear against the drum 28, pursuing a helical path with respect to the surface thereof and maintaining a constant speed.

The body 9 is secured to the arm 10 by screws 38 and carries a diaphragm holder in the form of a ring 39. The said ring is provided with a seat 40 against which a diaphragm 41 of glass or other suitable material is clamped by a ring 42 threaded within the ring 39. The upper surface of the ring 42 forms a seat for a second diaphragm 43 which may also be of glass, and the same is clamped against its seat by a washer 44 and clamping ring 45 threaded in the ring 39. Between the diaphragm 41 and 43 is an air space 46. The diaphragm 41 is connected by a link 47 to one end of a lever 48 whose opposite end carries a recording stylus 49 preferably of sapphire and of a shape commonly used in phonographic recording. The lever 48 is pivoted at 50 to the lug or lugs 51 projecting downwardly from the compensating weight 52 which is pivoted at 53 to a lug projecting downward from the ring 39 and is supported at its free end by a screw 54 so as to be capable of a slight vertical movement in a well known manner, to compensate for irregularities in the surface or shape of the cylinder 1. Secured to the diaphragm 43 in any suitable manner is a spring arm 55 which carries near its free end a small contact plate 56 of platinum or other suitable material. The plate 56 is pressed frictionally and elastically against the wheel 20 by means of an adjusting screw 57 threaded in one wall of the body 9, and engaging a block of soft rubber 58 bearing against the arm 55, the block 58 being secured in position by means of a pin or stud 59 embedded therein and engaging a socket 60 in the end of the screw 57. The telephonic line wires 61 and 62 over which the electric undulations are received are connected respectively to the arm 55 and shaft 22.

The message is spoken into the telephonic transmitter 63 in the usual manner, and the current induced thereby is transmitted over the wires 61 and 62 to the receiver. The main shaft 3 being driven by its motor, the arm 10 is lowered so as to bring the stylus 49 into engagement with the surface of the

record cylinder 1 and the friction wheel 20 is given a constant rotary movement by means of the roller 29 bearing on the drum 28 and driving the shaft 22 through the intermediate gearing. The friction block 56 being pressed against the wheel 20 with considerable pressure, friction will be created which will exert a thrust upon the arm 55, thereby placing the diaphragm 43 under elastic stress. As the strength of the current passing through the block 56 and wheel 20 varies, the amount of friction will vary. Consequently, the diaphragm 43 will be periodically relieved from the thrust of the arm 55, being thus caused to vibrate in accordance with the undulations of the electric current. By providing an air chamber 46, between the two diaphragms as explained, and by connecting the stylus 49 to the diaphragm 41, an elastic cushion is formed which transmits the vibrations of the diaphragm 43 to the diaphragm 41, while at the same time any relatively slow and extreme movements to which the diaphragm 43 may be subjected due to abnormalities in the electric circuit, will not be transmitted, or at least completely transmitted to the diaphragm 41 and in consequence the vibrations recorded on the cylinder 1 will be more nearly representative of sound vibrations. At the same time it will be understood that a single diaphragm may be employed, and also that the lever 48 may be connected directly with the spring arm 55, in which case both diaphragms will be omitted. The entire telephonic receiver travels with the carrier arm 10 along the surface of the recording cylinder 1, whereby a record will be produced in the form of a spiral groove whose pitch is equal to that of the feed screw 15, and whereby a message of considerable length may be recorded by the instrument.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is as follows:

1. In a recording telephone, the combination with the transmitter and line conductors, of a traveling phonographic recording surface, a carrier movable across said surface, a phonographic-stylus and friction wheel carried by the carrier, means comprising a friction member pressing on said wheel for vibrating said stylus, and connections whereby the line current is passed through the frictional contact, substantially as set forth.

2. In a recording telephone, the combination with the transmitter and line conductors, of a traveling phonographic recording surface, a carrier movable across said surface, a phonographic-stylus and friction wheel carried by the carrier, means comprising a friction member pressing on said wheel for vibrating said stylus, connections where-

by the line current is passed through the frictional contact, and means for driving said friction wheel, substantially as set forth.

3. In a phonic apparatus, the combination
5 of a rotating mandrel, a carriage movable longitudinally thereof, a shaft mounted on the carriage, a friction wheel carried by said shaft, a rotating drum, a roller carried by said carriage and pressed against the surface of said drum and driving connections
10 between said roller and shaft, substantially as set forth.

4. In a phonic apparatus, a rotating friction wheel, a diaphragm, a friction member connected to said diaphragm and pressing against said friction wheel, a second diaphragm, an air chamber between said diaphragms, a phonographic recording surface, and a recording stylus in operative engagement with said surface and connected to said second diaphragm, and means representative of sound vibrations for varying the friction between the friction member and friction wheel, substantially as set forth.

25 5. In a recording telephone, the combination with a rotating friction wheel, a friction

surface in contact therewith, means for electrically varying the friction in correspondence to sound waves whereby said friction surface will partake of amplified vibrations and means for recording phonographically the vibration developed by said friction surface, substantially as and for the purposes set forth.

6. In a phonic apparatus, the combination of a rotating mandrel, a carriage movable longitudinally thereof, a shaft mounted on the carriage, a friction wheel carried by said shaft, a rotating drum, a swinging arm carried by said carriage, a friction roller carried by said arm and pressed against the surface of said drum, and driving connections between said roller and shaft for rotating said shaft from the roller, substantially as set forth.

This specification signed and witnessed this 14th day of September, 1905.

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Witnesses:

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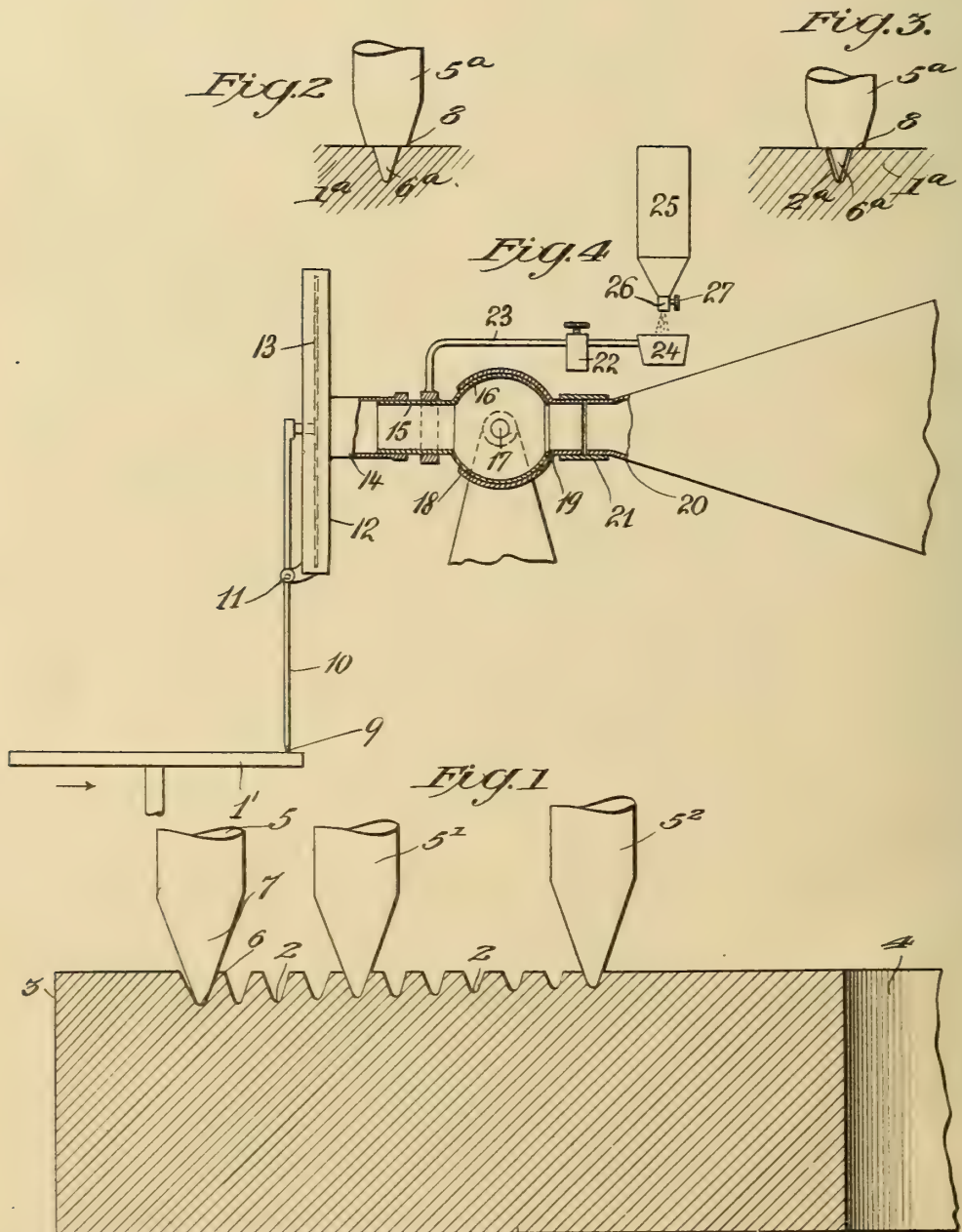
Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

1,012,710

S. C. PORTER.
SOUND REPRODUCER AND RECORD.
APPLICATION FILED MAY 13, 1911.

1,012,910.

Patented Dec. 26, 1911.



Witnesses:
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J. M. Baeder.

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UNITED STATES PATENT OFFICE.

STEPHEN C. PORTER, OF MARTINSVILLE, NEW JERSEY, ASSIGNOR OF ONE-HALF TO
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SOUND REPRODUCER AND RECORD.

1,012,910.

Specification of Letters Patent.

Patented Dec. 26, 1911.

Application filed May 13, 1911. Serial No. 626,994.

To all whom it may concern:

Be it known that I, STEPHEN C. PORTER, a citizen of the United States, and a resident of Martinsville, Somerset county, State of New Jersey, have invented certain new and useful Improvements in Sound Reproducers and Records, of which the following is a description.

My invention relates to sound reproducing devices and records, and particularly to records having a continuous record groove formed thereon of the laterally undulating type and the needle or stylus which tracks the said record groove and co-acts therewith to reproduce the sound recorded. In such records, as commonly made, the groove is in the form of a spiral upon the surface of a record disk or tablet, the groove being of uniform depth throughout its length, or of slightly increasing depth from beginning to end. The reproduction of sound from a record of this character is effected by the lateral movement of the stylus, as it follows the lateral undulations of the groove. The stylus or needle which tracks such a groove is usually formed of soft steel, and has a conical point which roughly fits within the record groove, when it is first positioned therein. When the record is rotated the point of this stylus is worn away and blunted by contact with the record surface, after the record has progressed a short distance, so that it fits within the record groove closely. At the end of the reproduction the needle has generally been worn to such an extent that it must be thrown away, and a new needle substituted before the reproducer is used again. The wear of a needle of the character referred to is sufficient to cause the same to accurately fit within the record groove after probably only a fraction of one revolution of the record, and the tracking of the needle is theoretically correct at this point at which the needle completely fits the groove. The wear of the needle, however, continues as the record is rotated which causes the tracking of the needle and the reproduction of the record to become more and more imperfect from this point to the end of the reproduction. This is so, because the continued wearing away of the point and adjacent sides of the conical bearing surface of the needle causes the latter to descend, so that the thicker portion of the needle descends to the level of the up-

per surface of the record. That is, the diameter of that portion of the cone which is at the level of the upper surface of the record at the end of the reproduction is greater than the diameter of that portion of the cone which is in line with the upper surface of the record at the beginning of the reproduction, because of the wearing away of the apex or point of the cone upon the bottom of the record groove. As the record material is relatively hard and abrasive, and the width of the groove remains the same, this results in the undercutting of the needle by the record and the formation of shoulders upon the needle, which shoulders rest upon the surface of the record and therefore support the needle. I have verified this conclusion by examination, under the microscope, of used reproducing needles. From this point to the end of the reproduction, the point and adjacent sides of the needle continuing to wear, the needle fits more and more loosely in the groove resulting in an imperfect reproduction. I overcome this difficulty by the production of a record in which the record groove is of decreasing depth from beginning to end to compensate for the wear of the needle. Preferably the decrease in depth of the groove is gradual and progressive from beginning to end, although obviously the advantage of my invention might be attained at least in part if the decrease in depth of the groove from beginning to end is not exactly uniform. The varying depth of the groove does not affect the reproduction in the type of record referred to, as the reproduction is determined entirely by the lateral movement of the needle. As the needle wears away, the bearing surface for the lower end of the same continually rises so that the portions of the conical surface of the needle upon which otherwise shoulders would be formed to support the needle, are continually rising, and the point and conical sides of the needle continue to accurately fit within and perfectly track the groove. The means by which such a record may be produced is not material to the present invention which is concerned only with the record as an article of manufacture, and with the combination between such a record and a reproducing stylus or needle, formed of soft steel or other material which is relatively soft in comparison with sapphire and

other hard stylus materials which are not adapted to wear to fit within the groove of a record formed of compositions of which commercial disk sound records are made.

5 It may be said, however, that a master record is made in any desired manner, having a record of decreasing depth, preferably of uniformly decreasing depth, cut or otherwise formed thereon, a matrix is made from
10 this record from which commercial duplicate records, having grooves of a correspondingly decreasing depth, may be formed by pressing or otherwise, as desired. In the formation of the master record, the cutting
15 or recording stylus may be gradually and uniformly raised during its travel, or the pressure which forces the cutting point into the record material may be gradually decreased during the making of the record,
20 or as stated, a groove of the desired character may be formed in other ways. For purposes of illustration one method and means of recording in the desired manner upon the master record will be illustrated and
25 described.

In order that a clearer understanding of my invention may be had, attention is hereby directed to the accompanying drawings, forming part of this specification, in
30 which—

Figure 1 represents a cross section through a portion of a record disk showing a reproducing stylus or needle in contact with the record groove of the same, the needle being
35 shown in several positions, and the needle and record being greatly enlarged for the purposes of illustration. The record formed as illustrated and the combination of the same with the stylus shown, illustrates one
40 embodiment of my invention; Fig. 2 represents in enlarged cross section a reproducing needle co-acting with a record groove of the common type, showing the formation of shoulders upon the needle above the record
45 surface; and Fig. 3 represents in enlarged cross section the same needle tracking the same groove as that shown in Fig. 2, at a point in the reproduction of the record, subsequent to the point in the reproduction
50 represented by Fig. 2. Fig. 4 represents in side elevation and vertical cross section, one form of apparatus for forming the desired record groove upon a master record.

In the drawings the sound record disk or
55 tablet 1 is provided with a record groove 2, which, as illustrated, is of greatest depth at its beginning, adjacent to the periphery 3 of the record, the depth decreasing preferably progressively to the end of the record
60 groove adjacent to the center hole 4 of the record. I have shown the groove as of a conical cross section slightly rounded at the bottom, although my invention is not limited to this specific form of groove. Tracking the record and co-acting therewith to re-

produce the sound is the reproducing stylus or needle 5. As stated, this needle is formed of a material sufficiently soft to be worn by contact with the record groove so as to accurately fit the same, such a material being, for example, steel. It has a conical lower
70 end 6, the diameter of the shaft of the needle, shown at 7, being considerably greater than the maximum width of the groove. As shown in its position at the beginning of the
75 record to the extreme left in Fig. 1, this needle does not fit closely within the record groove. After a comparatively short distance of tracking, however, as illustrated by the position of the needle at 5', the wear of
80 the bearing surface of the needle has been sufficient to cause the same to accurately fit within the record groove. The final position of the needle is illustrated at 5², which position is nearest to the center hole of the
85 record, and in which, as is clearly shown, the depth of the groove has decreased to such an extent as to compensate for the wear of the needle, which still closely fits within the groove. The proportions of parts shown
90 in the figures, and the slant of the bottom of the groove, are exaggerated and are merely illustrative.

The defect which my invention is designed to overcome is illustrated by Figs. 2
95 and 3, in which a stylus or needle 5^a is tracking a groove of uniform or slightly increasing depth in the record 1^a. The needle is shown in Fig. 2 as having advanced far enough along the record, so that an annular
100 shoulder 8 is formed upon the needle, just above the upper surface of the record by the wearing away of the point of the needle. The needle is here represented as closely fitting
105 within the record groove, the weight of the needle being borne by the shoulders 8, which have just been formed thereon. In Fig. 3 the same needle is represented at a later point in the reproduction of the record than that shown in Fig. 2, the weight of the
110 needle is still supported by the shoulders 8, but the point and sides of the conical bearing surface 6^a of the needle have been so worn by rubbing against the bottom and sides of the record groove 2^a, as it fits very
115 loosely within the same, resulting in a faulty reproduction.

It is obvious that if it were desired to have the record begin near the center hole
120 4 of the record disk and progress toward the periphery of the disk, the groove nearest the center would be deepest and that nearest the periphery the most shallow.

I am aware that it has been proposed to compensate for the wear of the needle by forming a record groove of increasing width
125 throughout the length thereof, but this is objectionable, because, to cite one reason, a large number of grooves are commonly formed upon the record surface, and the
130

space between the same is extremely limited. Furthermore, increasing the width of a groove necessarily increases the depth as well, if the slant of the sides of the groove is maintained the same, thereby largely counter-acting the beneficial result of widening the groove as a compensation for the wear of a conically pointed needle.

In Fig. 4 is illustrated one of many forms of apparatus which may be employed in recording, to obtain a record groove of the desired character upon the master record, from which duplicate records are subsequently made in well known manner. As there illustrated, the master blank 1' is mounted for rotation, and is adapted to be fed toward the right, as shown by the arrow, past the recording needle 9 by suitable and well known mechanism. The needle 9 is carried by the lever 10 pivoted at 11 to the sound box 12, the upper end of the lever being secured to the center of diaphragm 13 in the sound box. The sound box has a neck 14 slidably mounted upon the end of a tube 15 having a cylindrical enlargement 16 mounted to oscillate in a vertical plane upon trunnions 17, and within a cylindrical bearing 18. The latter carries a short neck 19 which is joined to the end of the recording horn 20 by a flexible coupling 21. The weight of the sound box tends to cause the same to oscillate about trunnions 17, and cause the recording needle to sink into the record blank when the latter is revolved. The depth of the cut at the beginning of the record is regulated by a sliding weight 22 upon an arm 23 secured to the neck 15 as shown. The weight 22 may be secured at any desired point, on arm 23, beyond the pivot 17, to counterbalance the recorder and give the desired initial cut. Also carried by arm 23 is a cup 24, above which is a receptacle 25, having a nozzle 26 of a bore or opening adjustable by screw 27. The receptacle 25 may be filled with fine sand, lycopodium powder, or other fine fluid material

either granular or liquid. When the machine is started, the valve 27 is opened to the desired extent, and a fine stream of material is allowed to flow uninterruptedly into cup 24 throughout the making of the record. This results in gradually and continually decreasing the pressure on the stylus as the latter progresses from the periphery of the record toward the center of the same, resulting in the desired groove of continually decreasing depth. As the granular material falls into cup 24 in a steady stream, there is no harmful vibration imparted to the recorder thereby. Obviously, other equivalent methods of obtaining the same result may be used, if desired.

Having now described my invention what I claim as new and desire to protect by Letters Patent is:—

1. As a new article of manufacture, a sound record having a continuous record groove of gradually decreasing depth throughout its length, from beginning to end, substantially as described.

2. As a new article of manufacture, a sound record having a continuous record groove of the laterally undulating type, the depth of which decreases progressively and uniformly from the beginning to the end thereof, substantially as described.

3. As a new article of manufacture, a sound record having a continuous record groove of the laterally undulating type, the depth of which groove decreases from the beginning to the end thereof in such manner as approximately to compensate for the wear of a reproducing stylus or needle when the latter is tracking the same, substantially as described.

This specification signed and witnessed this 9th day of May, 1911.

STEPHEN C. PORTER.

Witnesses:

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511,003

J. C. ENGLISH.
TALKING MACHINE.

APPLICATION FILED SEPT. 2, 1909.

Patented Dec. 26, 1911.

5 SHEETS—SHEET 1.

1,013,003.

Fig. 1.

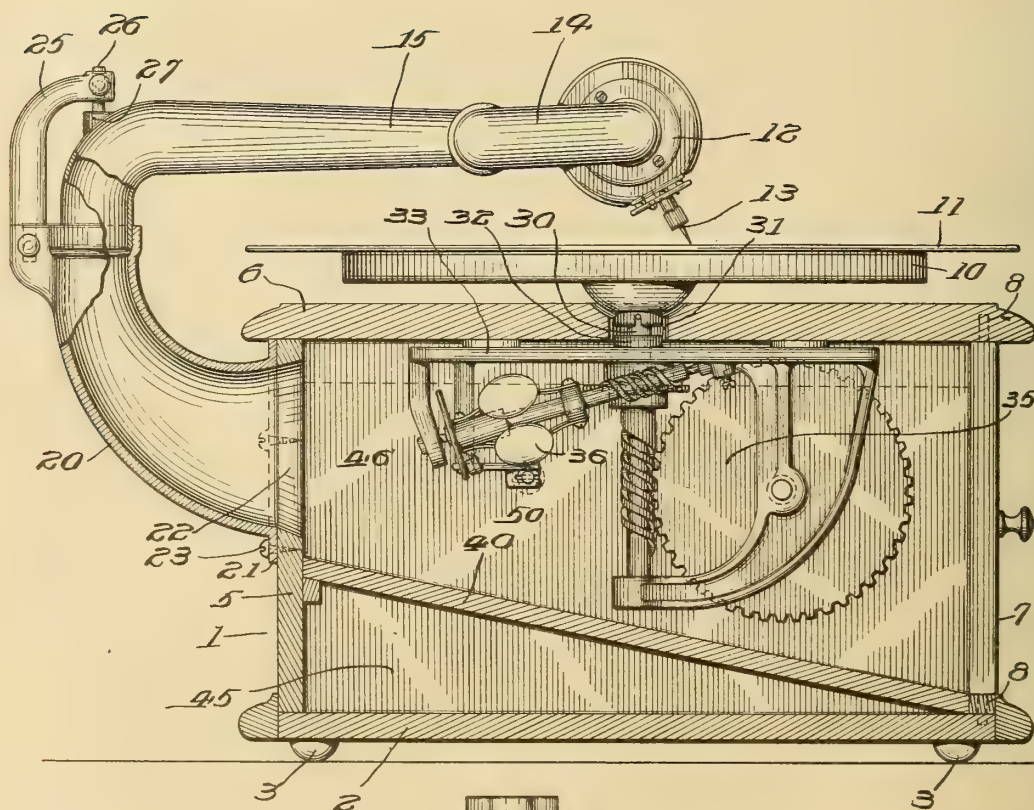
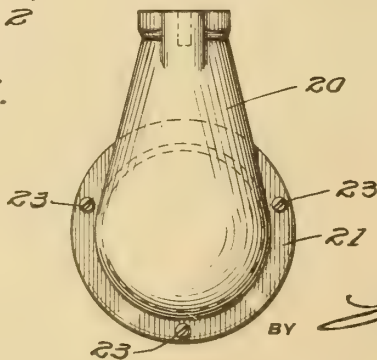


Fig. 3.



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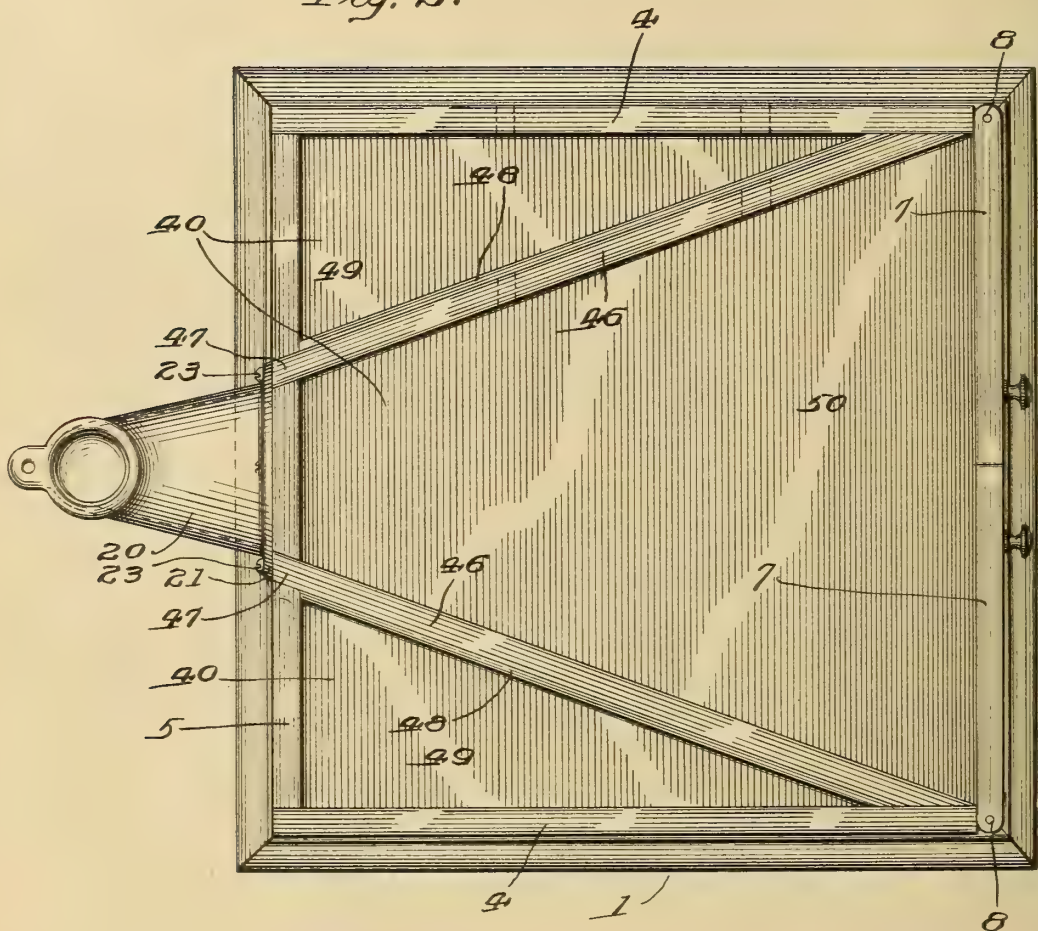


1,013,003.

J. C. ENGLISH.
TALKING MACHINE.
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Patented Dec. 26, 1911.
5 SHEETS—SHEET 2.

Fig. 2.



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TALKING MACHINE.

APPLICATION FILED SEPT. 2, 1909.

Patented Dec. 26, 1911.

5 SHEETS—SHEET 3.

1,013,003.

Fig. 4.

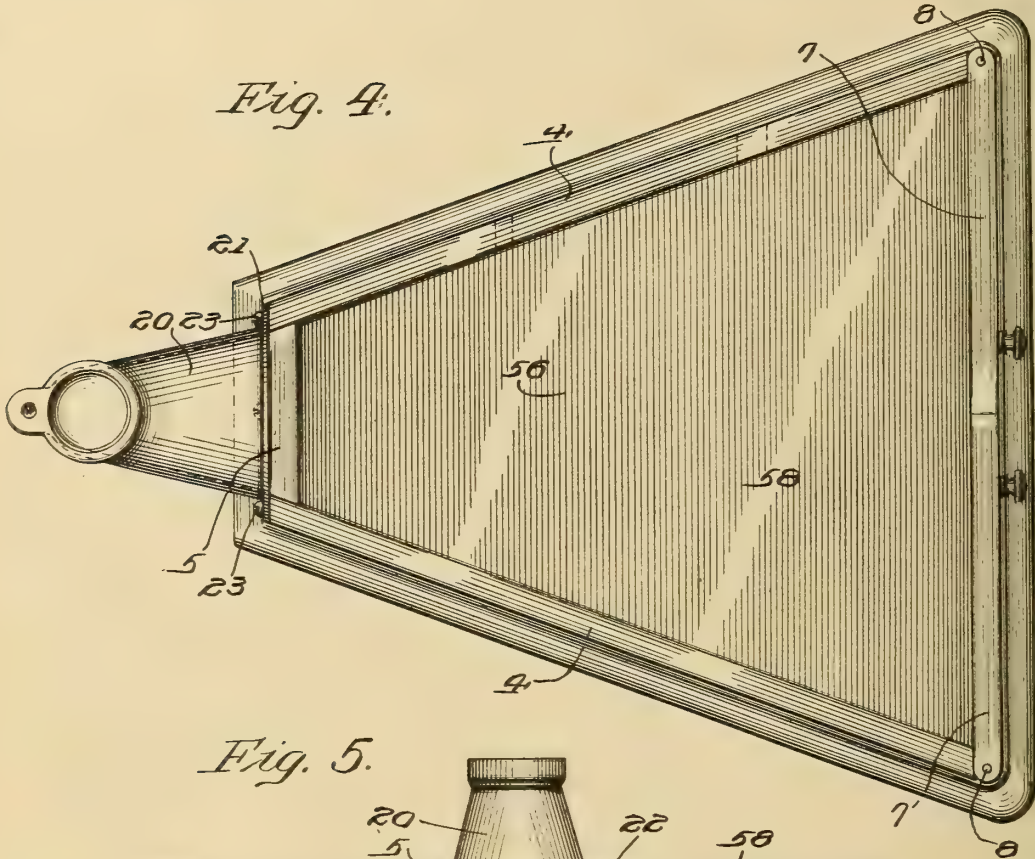
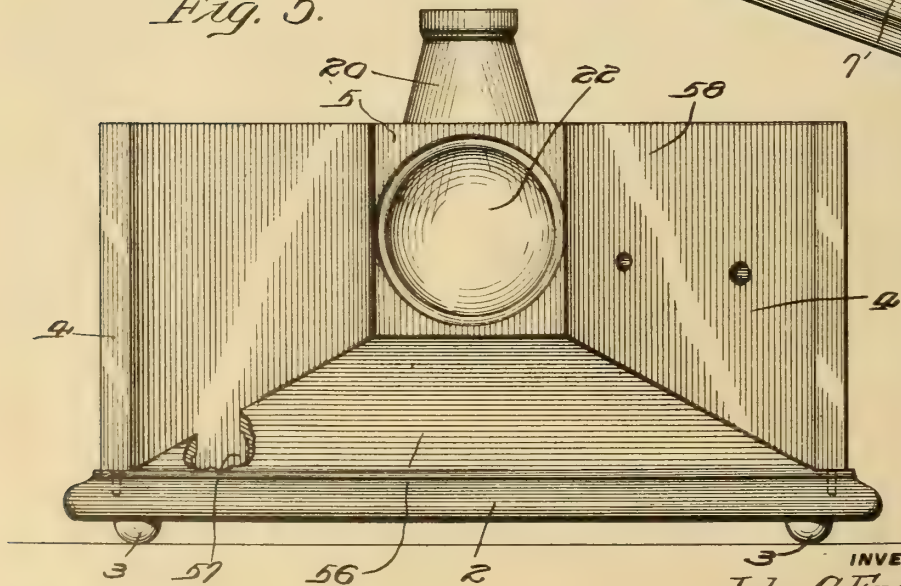


Fig. 5.



WITNESSES

H. J. Hartmann.

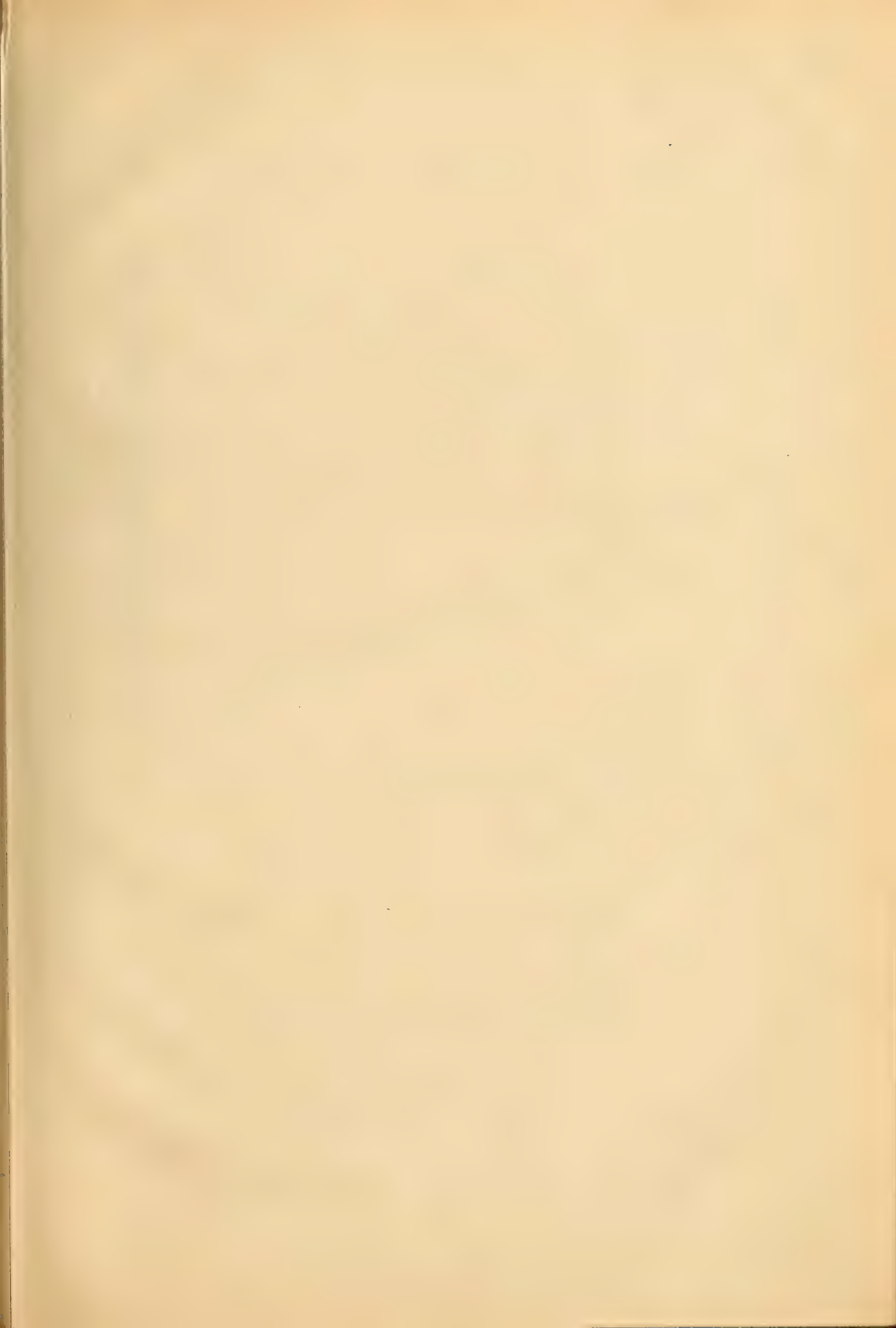
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1,013,003.

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APPLICATION FILED SEPT. 2, 1909.

Patented Dec. 26, 1911.

5 SHEETS—SHEET 4

Fig. 6.

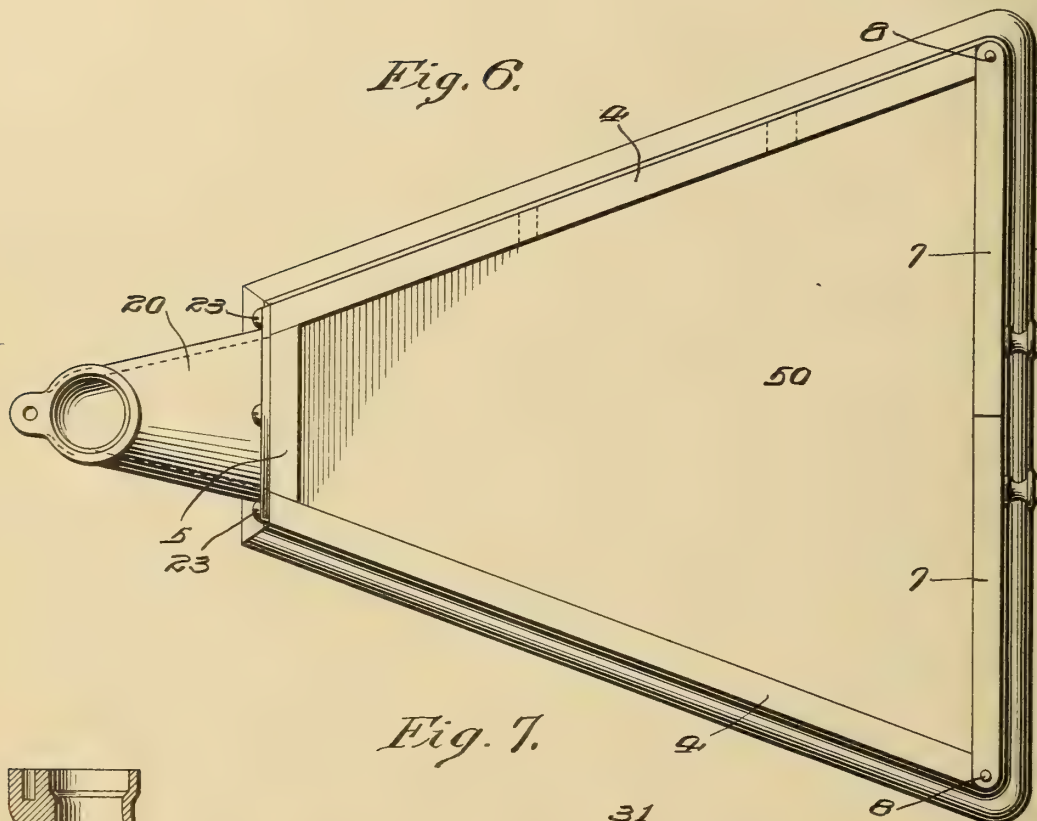
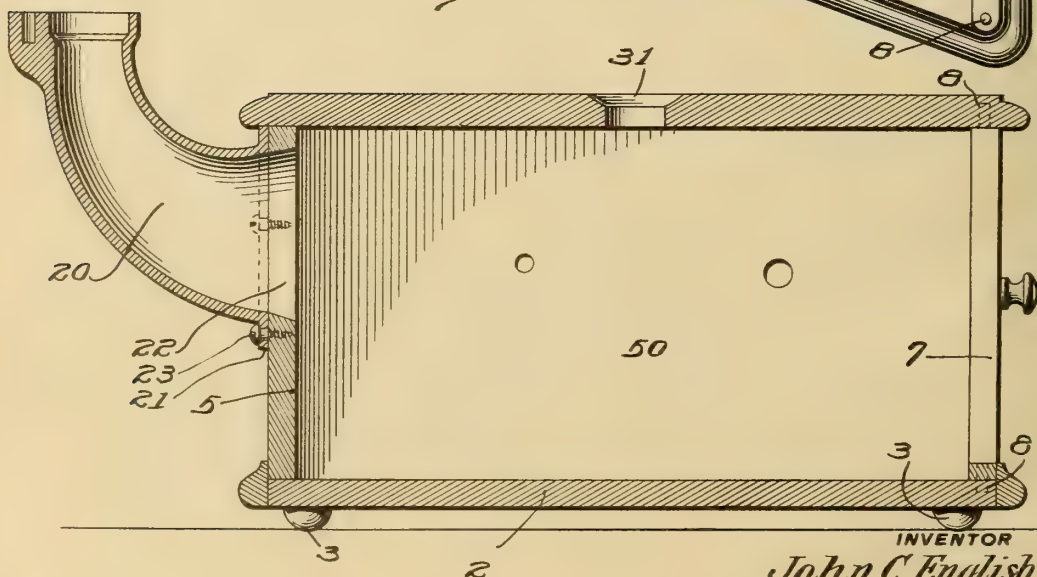


Fig. 7.



INVENTOR

John C. English,

BY

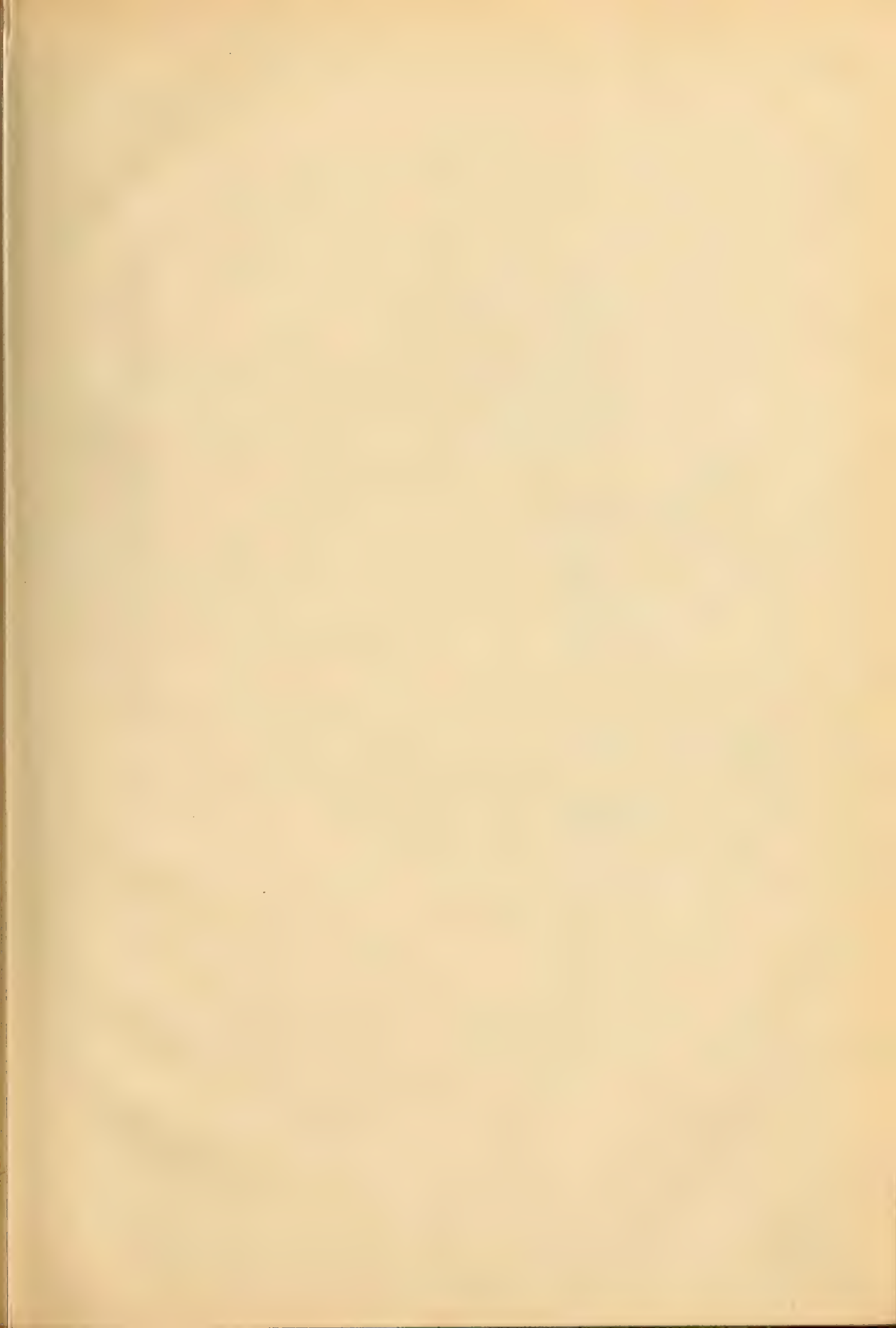
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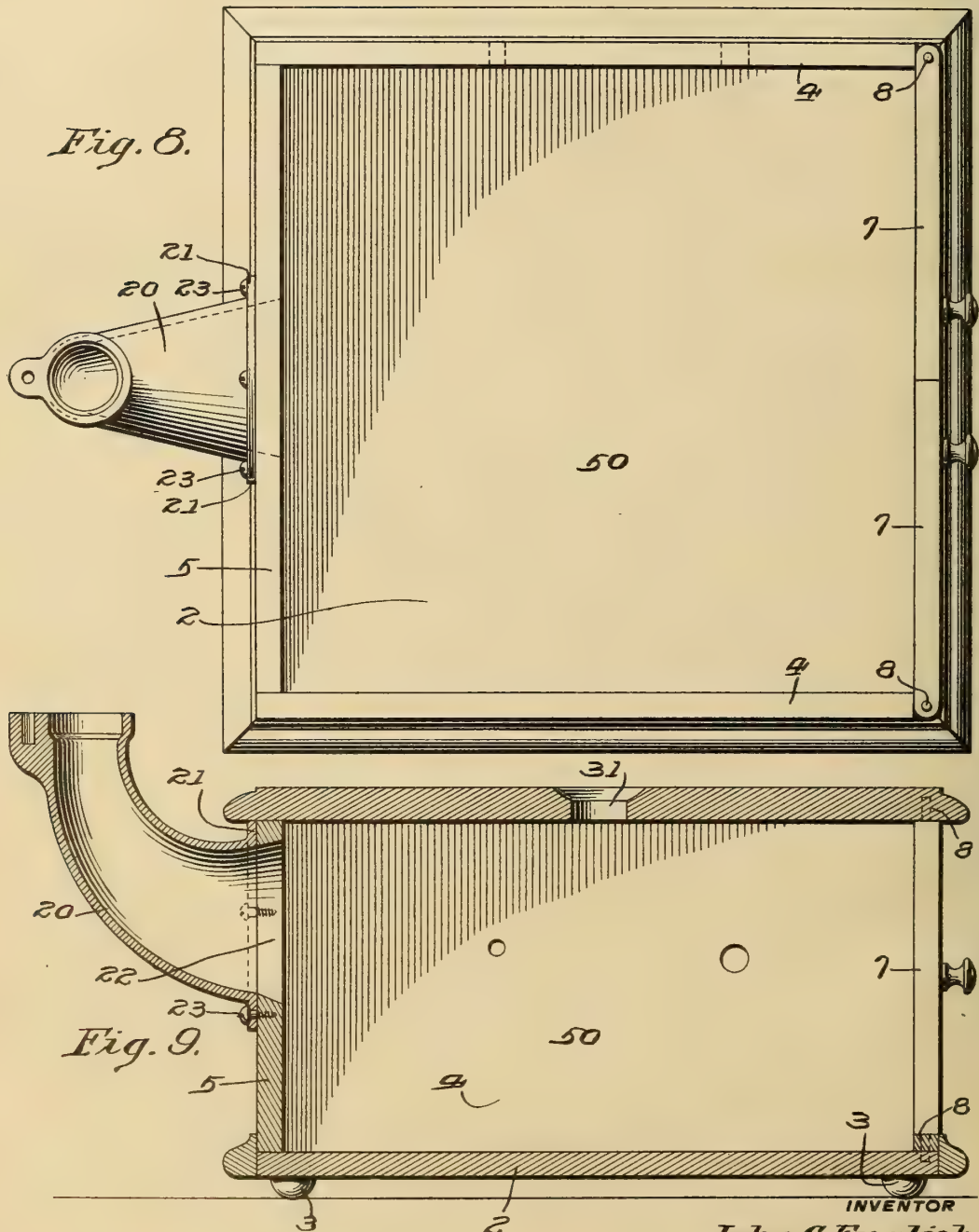
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1,013,003.

Patented Dec. 26, 1911.

5 SHEETS—SHEET 5.



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TALKING-MACHINE.

1,013,003.

Specification of Letters Patent.

Patented Dec. 26, 1911.

Application filed September 2, 1909. Serial No. 515,838.

To all whom it may concern:

Be it known that I, JOHN C. ENGLISH, a citizen of the United States, and a resident of the city of Camden, county of Camden, and State of New Jersey, have invented certain new and useful Improvements in Talking-Machines, of which the following is a full, clear, and complete disclosure, reference being had to the accompanying drawings, forming a part of the following specification.

This invention relates to certain new and useful improvements in talking machines as will be hereinafter fully described, and particularly pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a vertical longitudinal, central section of a talking machine constructed in accordance with this invention; Fig. 2 a top plan view of the same with the cover and other parts removed for clearness; Fig. 3 a rear elevation of a detail of the same; Fig. 4 a top plan view of a modified form of motor casing which may be used in applying this invention, the top of the casing being omitted for clearness; Fig. 5 a front elevation of the casing shown in Fig. 4, but with the doors removed, the top being omitted as before; Fig. 6 a top plan view of a second modified form of motor casing which may be used in applying this invention, the top of the casing being omitted for clearness; Fig. 7 a vertical central, longitudinal section of the modification shown in Fig. 6 but with the cover in place; Fig. 8 a top plan view of a third modified form of motor casing which may be used in applying this invention, the cover of the casing being removed for clearness, and Fig. 9 a vertical, central, longitudinal section of the modified casing shown in Fig. 8, but with the cover of the casing in place.

Referring to the drawings, particularly to Figs. 1 to 3, one embodiment of this invention comprises a substantially rectangular casing 1 having a base or bottom 2 mounted upon supports 3, and having side walls 4, 4, a rear wall 5, a removable top or cover 6, and two movable doors or closures 7, mounted upon pintles 8 between the top and bottom of the casing, and forming the front of the casing.

Mounted upon the casing 1 is a turntable or rotary record support 10 for supporting the usual disk record 11, and arranged above the turntable 10 in coöperative relation therewith, is the usual sound box 12 or other suitable sound reproducing means carrying a stylus 13 adapted to coöperate with the record 11.

The sound box or sound reproducer 12 is carried by and communicates with a U-tube 14 which is pivotally supported by the free smaller inner end of a hollow tapering tone arm 15 with which it communicates. The outer end of the tone arm 15 curves downwardly and engages rotatably in the upper free end of a downwardly extending and downwardly flaring hollow, curved bracket 20, the lower end of which is provided with an outwardly extending flange 21, and is rigidly secured to the back 5 of the casing 1 so as to register with an inwardly flaring aperture 22, through the back of the casing, by means of screws 23 or other fastening devices extending through the flange. The upper end of the hollow bracket 20 is provided with an upwardly extending arm 25 rigidly but detachably connected thereto, the upper end of which extends forwardly over the downwardly curved portion of the tone arm, and carries a pivot 26 which engages rotatably in a lug 27, fixed upon the tone arm to hold the tone arm rotatably in position.

The turntable 10 is removably fixed upon the upper end of a spindle 30 which projects downwardly through a centrally arranged aperture 31 in the cover 6 of the casing, and the spindle is rotatably supported in a lug 32 carried by a plate 33 which is secured to the under side of the cover 6. A suitable motor or actuating mechanism 35 depends downwardly within the casing from the plate 33 and is operatively connected to rotate the spindle 30. A suitable governor 36, also depends in the casing from the plate 33 for controlling the speed of the motor.

For amplifying and deflecting the sound waves in the casing 1, one or more sounding boards may be arranged in the casing; for instance, one sounding board 40 may be inclined from the front edge of the bottom 2 of the casing rearwardly, and upwardly to

the back 5 of the casing, abutting against the inner surface of the back in a horizontal line slightly below the sound conducting opening 22 through the back of the casing, the front edge of this board resting upon the upper surface of the bottom 2 of the casing, and the side edges of the board abutting against the inner surfaces of the sides 4 of the casing. This sounding board forms with the bottom of the casing and the lower portions of the sides and end of the casing, an inclosed chamber 45 beneath the sounding board, and it is considered that this inclosed chamber increases the effectiveness of the sounding board. Other sounding boards, in addition to the sounding board 40 already described, may be arranged within the casing, for instance, two rearwardly converging vertical boards 46 may be located between the downwardly inclined sounding board 40 and the top 7 of the casing, the rear ends 47 of these vertical boards either extending through or abutting against the rear wall 5 of the casing and being arranged upon opposite sides respectively and adjacent to the sound conveying opening 22 in the rear wall of the casing. The forward ends of these boards are preferably beveled and abut against the inner surfaces of the side walls 4 of the casing adjacent the front edges thereof respectively. A stiffening rib 48 may be secured to the upper edge of each sounding board 46. If preferred, the vertical sounding boards 46 may be extended for their full lengths to the bottom of the casing, and the inclined board 40 may be tapered rearwardly in width so as to extend only between the vertical boards. An inclosed chamber 49 is formed by each of these vertical sounding boards 46 between the sounding board and the adjacent side of the wall 4 of the casing, and above the downwardly inclined sounding board 40, and the action of the vertical sounding boards is similar to the action of the downwardly inclined sounding board 40 in amplifying and deflecting the sound waves transmitted through the machine.

In the above described embodiment of this invention, the motor or actuating mechanism of the machine is suspended in a sound conduit 50 formed by the sounding boards 40 and 46 and by the cover 6 of the casing, and this conduit is in communication with the sound reproducer 12 through the opening 22 in the rear wall of the casing, the hollow bracket 20, the tone arm 15 and the U tube 14.

In the operation of this form of the invention, the sounding boards and the cover or top of the casing forming the walls of the conduit 50, act to amplify and to deflect the sound waves, which are transmitted and delivered from the reproducer 12 through the conduit 50. The doors 7 forming the

front of the casing 1 may be opened outwardly to any extent desired to vary the intensity of the sound issuing from the casing, or to deflect it in any desired direction, but the doors may obviously be omitted if preferred, and the front of the casing left permanently open.

The casing used in applying this invention may be modified from that described above, by constructing the casing as shown in Figs. 4 and 5 with rearwardly converging side walls so that in top plan view, the casing will taper rearwardly in width, the top 6 and bottom 2 of the casing being left parallel and doors 7 being used if desired, to form the front of the casing, as heretofore described. A downwardly and forwardly extending sounding board 56 corresponding in function to the sounding board 40 previously described, may be arranged in this tapering casing beneath the opening 22 in the rear of the casing, and forming an inclosed chamber 57 between the sounding board and the bottom 2 of the casing. In this modified form of the invention, a sound conduit 58 is formed between the downwardly extending sounding board 56 in the bottom of the casing, the rearwardly converging side walls 4, and the tapering top 7, and within this conduit, the motor or actuating mechanism of the machine is suspended as heretofore described, the conduit being in communication through a hollow bracket 20 with a sound reproducer arranged to coöperate with a record support mounted upon the cover of the casing, and rotated by the actuating mechanism within the sound conduit, as hereinbefore described.

A further modification of this invention comprises, as shown in Figs. 6 and 7, a tapering casing substantially identical with the tapering casing just described and shown in Figs. 4 and 5 but in which all internal sounding boards or deflecting boards other than the walls of the casing itself, are omitted from the interior of the casing. In this form of the invention, the bottom, top, rear and side walls of the casing form the four walls of an outwardly flaring sound conduit and sound amplifier 50, in which the actuating mechanism of the machine is suspended as heretofore described, and through which the sound waves are transmitted and delivered from a sound reproducer as heretofore described when the machine is in operation.

A further modification of the form of casing which may be used in this invention is illustrated in Figs. 8 and 9, and comprises a substantially rectangular casing 1 similar to that previously described and shown in Figs. 1 to 3, and the machine in all its details having this latter modified form of casing, is substantially identical

with the machine first described and shown in Figs. 1 to 3, except that sounding boards or deflecting boards other than the walls of the casing itself are not used in the interior of the casing, and the walls of the casing form the walls of a sound conduit or amplifier 50, in which the motor or actuating mechanism of the machine is suspended, and through which the sound waves are transmitted and delivered from the machine as hereinbefore described, the walls of the casing acting to amplify and to deflect the sound waves being transmitted.

Although only a few of the forms in which this invention may be embodied have been illustrated, it is obvious that many changes might be made in the construction shown, but the right is reserved to make any or all changes in the construction which do not depart from the spirit of this invention or the scope of the appended claims.

I have found that in the reproduction of sound from the invention hereinbefore described that there is a new and improved result, not only in increased volume, but in the quality, purity and resonance of the sound reproduced, and while at the present time it may be that I may not be fully informed as to the reasons by which this improved result in volume and quality of tone is secured, and while all of the advantages resulting from this invention may not now be fully known or appreciated, it may be said, and is thought to be apparent from the disclosures contained herein, that this invention provides a simple, compact talking machine, of few parts, and of inexpensive construction, that is very efficient in operation, and that gives a loud, clear reproduction of fine quality; and provides a talking machine in which space is economized by locating the motor or actuating mechanism of the machine in a sound conduit through which sound waves are delivered from the machine. It is also evident that this invention provides a talking machine in which the motor or actuating mechanism is inclosed in a casing which is also utilized in whole or in part as a sound amplifier; and provides a talking machine in which the motor or actuating mechanism is inclosed in a conduit through which the sound waves are delivered from the sound reproducing mechanism of the machine, and having one or more sounding boards or deflectors arranged to be coöperated with by the sound waves. It is also evident that this invention provides a talking machine in which the motor or actuating mechanism is inclosed in an improved casing adapted to be utilized as a sound amplifier; provides a talking machine in which the motor or actuating mechanism is inclosed by a casing, and in which the interior of the casing is divided by one or more sounding board-

to form one or more inclosed spaces adjacent the space containing the motor, and in which the space containing the motor is utilized as a channel for the transmission and delivery of sound waves from the machine; and provides other improvements as disclosed herein.

In view of the fact that the advantages of and the theory or theories concerning the operation of the talking machine forming the subject-matter of this invention may not be fully known or appreciated at this time, the right is reserved to supplement this disclosure by further statements in regard to the theories or advantages of the machine as such become better known.

Having thus described my invention, I claim and desire to protect by Letters Patent of the United States:

1. A talking machine comprising a tapering sound conduit and actuating mechanism for said machine located in said conduit.
2. A talking machine comprising a sound conduit, actuating mechanism for said machine located in said conduit, and means for varying the intensity of sound transmitted through said conduit.
3. A talking machine comprising a sound conduit, actuating mechanism for said machine located in said conduit, and a movable closure for varying the intensity of sound transmitted through said conduit.
4. A talking machine comprising a sound conduit sound reproducing means, located outside of said conduit and communicating therewith, and actuating mechanism for said machine located in said conduit.
5. A talking machine comprising a rotary record support, sound reproducing means coöperating with said support, a sound conduit leading from said sound reproducing means, and actuating mechanism for said record support located in said sound conduit.
6. A talking machine comprising a sound conduit, sound reproducing means outside of said conduit and communicating therewith, a sounding board in coöperative relation with said conduit, and actuating mechanism for said machine located in said conduit.
7. A talking machine comprising a sound conduit, actuating mechanism for said machine located in said conduit, and a sounding board arranged to deflect the sound waves transmitted through said conduit.
8. A talking machine comprising a sound conduit, a sounding board in coöperative relation with said sound conduit, means forming a space outside of said conduit, and actuating mechanism for said machine located in said conduit.
9. A talking machine comprising a casing, a record support carried by said casing,

sound reproducing means in coöperative relation with said record support, a sound conduit communicating with said sound reproducing means and extending in said casing, and actuating mechanism for said machine located within said casing and in said conduit.

10. A talking machine comprising a casing, a record support carried by said casing, sound reproducing means outside of said casing in coöperative relation with said record support, a sound conduit communicating with said sound reproducing means and extending in said casing, and actuating mechanism for said machine located within said casing and in said conduit.

11. A talking machine comprising a casing, a record support carried by said casing, sound reproducing means in coöperative relation with said record support, a sounding board in said casing, and forming one wall of a sound conduit in communication with said sound reproducing means, and mechanism located in said sound conduit for actuating said record support.

12. A talking machine comprising a casing, a record support carried by said casing, sound reproducing means in coöperative relation with said record support, a plurality of sounding boards in said casing, and forming a plurality of walls of a sound conduit in communication with said sound reproducing means, and mechanism located in said conduit for actuating said record support.

13. A talking machine comprising a casing, a record support carried by said casing, sound reproducing means in coöperative relation with said record support, a plurality of sounding boards arranged in said casing and in angular relation to each other, forming a plurality of walls of a sound conduit in communication with said sound reproducing means, and mechanism located in said conduit for actuating said record support.

14. A talking machine comprising a casing, a record support carried by said casing, sound reproducing means in coöperative relation with said record support, one of the walls of said casing forming a wall of a sound conduit, through which sounds are transmitted from said sound reproducing means, and actuating mechanism for said machine located in said casing and within said conduit, said record support being outside of said conduit.

15. In a talking machine, the combination with a casing provided with an opening in one of the walls thereof, of sound reproducing means located outside of said casing and communicating with the interior of said casing through said aperture, a record support carried by said casing in coöperative relation with said sound reproducing means, one wall of said casing forming a part of a

sound conduit through which sounds are transmitted and delivered from said sound reproducing means, and actuating mechanism for said machine located within said casing and in said conduit.

16. In a talking machine, the combination with a casing provided with an aperture arranged above the bottom of said casing, of a sounding board within said casing and beneath said aperture and forming the lower wall of a sound conduit, sound reproducing means communicating through said aperture with said conduit, and actuating mechanism for said machine located in said conduit.

17. In a talking machine, the combination with a casing provided with an aperture spaced from the bottom of said casing, of sound reproducing means communicating with the interior of said casing through said aperture, a sounding board in said casing and extending beneath said aperture, sounding boards arranged within said casing upon opposite sides of said aperture respectively, said sounding boards forming part of a sound conduit through which sounds are transmitted and delivered from said sound reproducing means, and actuating mechanism for said machine located in said conduit within said casing.

18. A talking machine comprising a sound conduit and amplifier, actuating mechanism for said machine located in said conduit and amplifier, and sound reproducing means located outside of said conduit and amplifier, and communicating therewith.

19. A talking machine comprising a casing provided with an opening in one wall thereof, a hollow bracket secured at one end to said wall, sound reproducing means communicating with the other end of said bracket, a record support carried by said casing in coöperative relation with said sound reproducing means, and actuating mechanism for said machine located within said casing, said sound reproducing means being in communication through said bracket and said opening with the space in said casing surrounding said actuating mechanism, whereby said casing serves to inclose said motor and to form a sound conduit and sound amplifier for said sound reproducing means.

20. In a talking machine, the combination with a casing provided with an opening in one wall thereof, of a hollow bracket secured at one end exteriorly to said wall and in communication with the interior of said casing through said opening, sound reproducing means communicating with the other end of said bracket, and actuating mechanism for said machine located in said casing in the space communicating with said bracket.

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21. In a talking machine, the combination with a sound amplifier, of sound reproducing means outside of said amplifier, and actuating mechanism for said machine located in said amplifier.

22. In a talking machine, a casing having one of its walls forming part of a sound amplifier, sound reproducing means outside of and communicating with said amplifier, and actuating mechanism for said machine located in said amplifier.

23. In a talking machine, a casing having one of its walls forming one wall of a sound amplifier, a sounding board within said casing and forming another wall of said amplifier, actuating means for said machine located in said amplifier, and sound reproducing means carried by said casing and communicating with said amplifier.

24. A talking machine comprising a casing having a substantially horizontal upper wall forming an upper wall of a sound conduit, a sounding board within said casing between said wall and the bottom of said casing forming a lower wall of said conduit, sounding boards within said casing forming the side walls of said conduit, and sound reproducing means communicating with said conduit.

25. A talking machine comprising a casing having a substantially horizontal upper wall forming the upper wall of a sound conduit, an inclined sounding board in said casing between said wall and the bottom of said casing forming a lower wall of said conduit, diverging sounding boards in said casing forming side walls for said conduit, and sound reproducing means communicating with said conduit.

26. A talking machine comprising a casing having an opening in each of two upwardly extending opposite walls thereof, one of said openings being smaller in area than the other, said casing having a substantially horizontal upper wall between said first mentioned walls and forming the upper wall of a sound amplifier, a sounding board within said casing beneath said openings and inclined downwardly from the smaller opening toward the larger opening, two sounding boards spaced upon opposite sides respectively of said openings and diverging in said casing from said smaller opening toward said larger opening, forming the opposite sides of said amplifier, and sound reproducing means communicating with said amplifier through said smaller opening.

27. In a talking machine, the combination with a casing provided with an opening in one wall thereof, of a hollow, flaring bracket rigidly secured at its larger end to said wall and in communication with the interior of said casing, sound reproducing means communicating with the other end of

said bracket, and a record support carried by said casing in coöperative relation with said sound reproducing means.

28. A talking machine comprising a casing, a sounding board inclosed by said casing forming a portion of a sound conduit, sound reproducing means coöperating with said conduit, and actuating mechanism for said machine located in said conduit.

29. A talking machine comprising a casing, an inclined sounding board inclosed by said casing and forming a portion of a sound conduit, sound reproducing means coöperating with said conduit, and actuating mechanism for said machine located in said conduit.

30. A talking machine comprising a plurality of diverging sounding boards arranged to form a plurality of exterior walls of a tapering sound conduit, and actuating mechanism for said machine located in said conduit.

31. A talking machine comprising a sound conduit, a rotary record support arranged outside of said conduit and actuating mechanism for said support arranged within said conduit.

32. A talking machine comprising hollow sound amplifying means, a record support arranged outside of said amplifying means, sound reproducing means coöperating with said record support, and actuating mechanism for said machine located within said sound amplifying means.

33. A talking machine comprising a sound conduit, a record support, sound reproducing means coöperating with said support outside of said conduit, and actuating mechanism for said machine arranged in said conduit.

34. A talking machine comprising the combination with hollow sound amplifying means, of sound reproducing means, tubular sound conveying means through which said sound reproducing means communicate with said amplifying means, and actuating means for said machine located in said sound amplifying means.

35. A talking machine comprising the combination with hollow sound amplifying means, of sound reproducing means, tubular sound conveying means comprising relatively movable portions, through which said sound reproducing means communicate with said amplifying means, and actuating means for said machine located in said sound amplifying means.

36. A talking machine comprising a sound conduit including a hollow stationary portion and a movable tubular portion, sound reproducing means coöperating with said conduit and actuating mechanism for said machine located in said stationary portion of said conduit.

37. A talking machine comprising a sound

conduit including a hollow stationary portion and a movable tubular portion, sound reproducing means carried by said movable portion and cooperating with said conduit and actuating mechanism for said machine located in said stationary portion of said conduit.

38. The combination with sound reproducing means of hollow sound amplifying means, a tubular sound conveyer, through which said sound reproducing means communicates with said sound amplifying means, a rotary record support and actuating mechanism for said support located in said amplifying means.

39. A talking machine comprising a casing provided with an opening forming a sound outlet, a sounding board inclosed by said casing, forming a portion of a sound conduit, and arranged to deflect sound waves toward said outlet and actuating mechanism for said machine in said conduit.

40. A talking machine comprising a casing provided with an opening forming a

sound outlet, an inclined sounding board inclosed by said casing, forming a portion of a sound conduit, and arranged to deflect sound waves toward said outlet, and actuating mechanism for said machine in said conduit.

41. A talking machine comprising a sound conduit, a rotary record support outside of said conduit, and actuating mechanism for said support cooperating therewith through a wall of said conduit.

42. A talking machine comprising a casing having a wall forming a portion of a sound conduit, a rotary record support and sound reproducing means cooperating therewith outside of said conduit, and actuating mechanism for said support extending within said conduit.

In witness whereof, I have hereunto set my hand this first day of September, A. D., 1909.

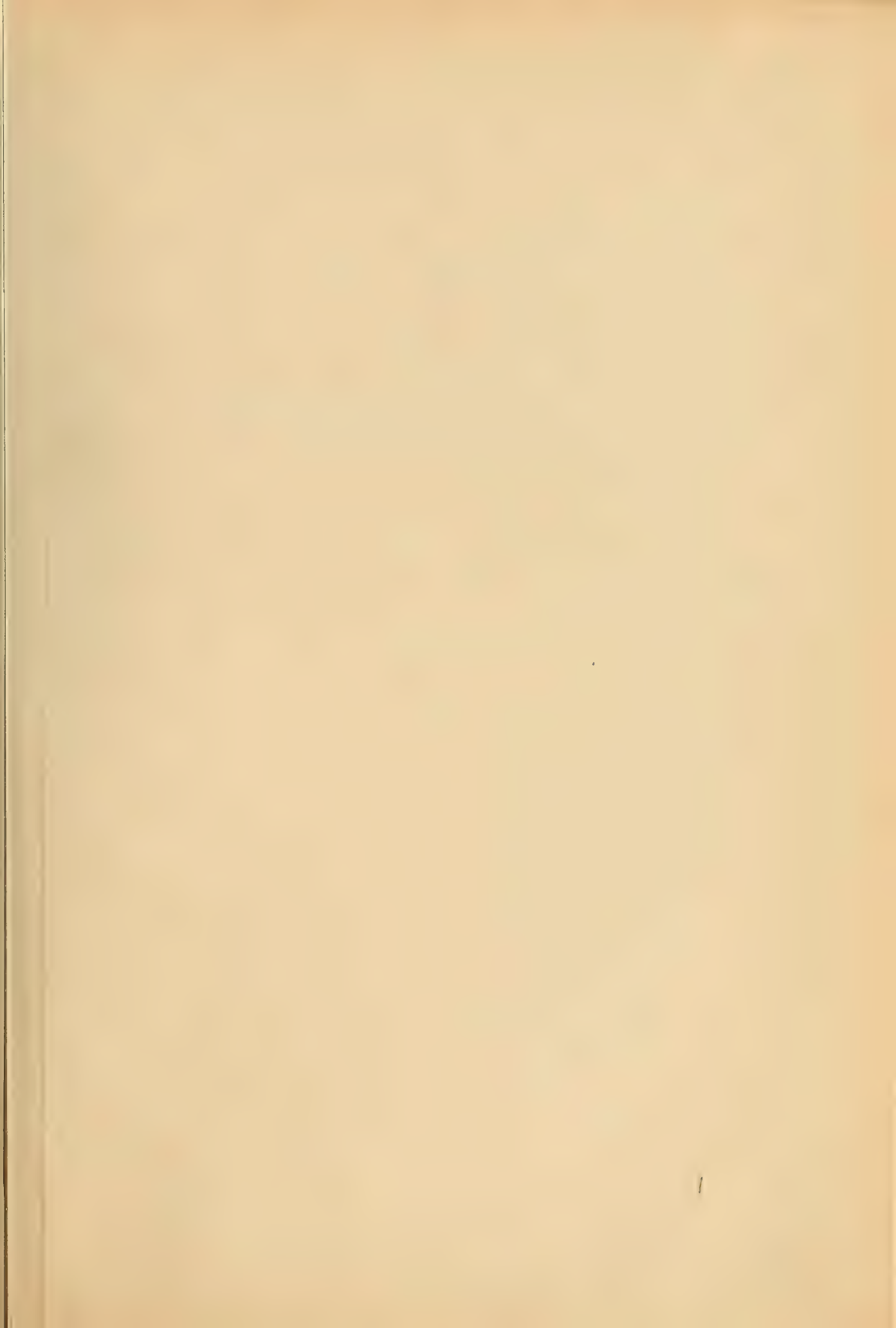
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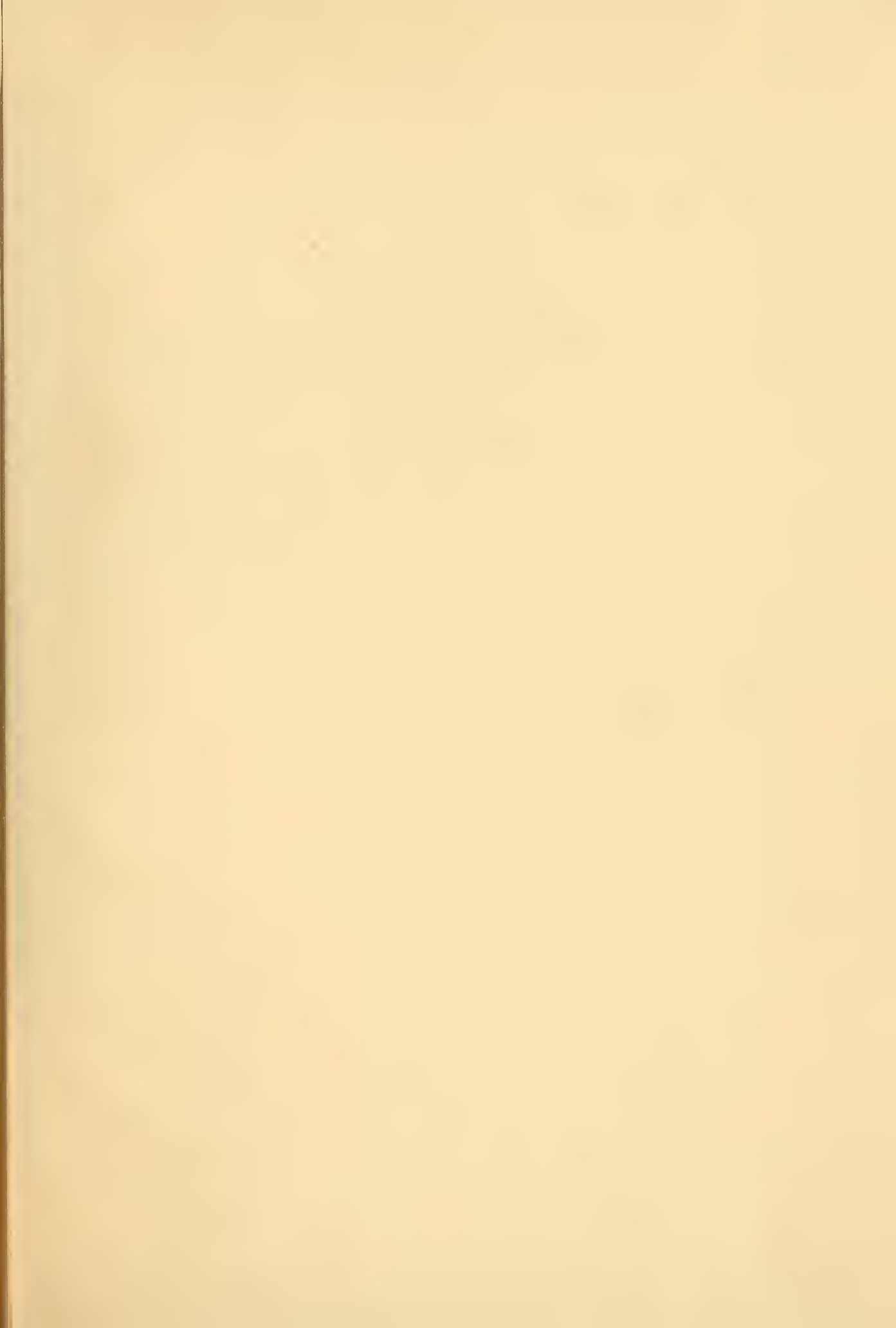
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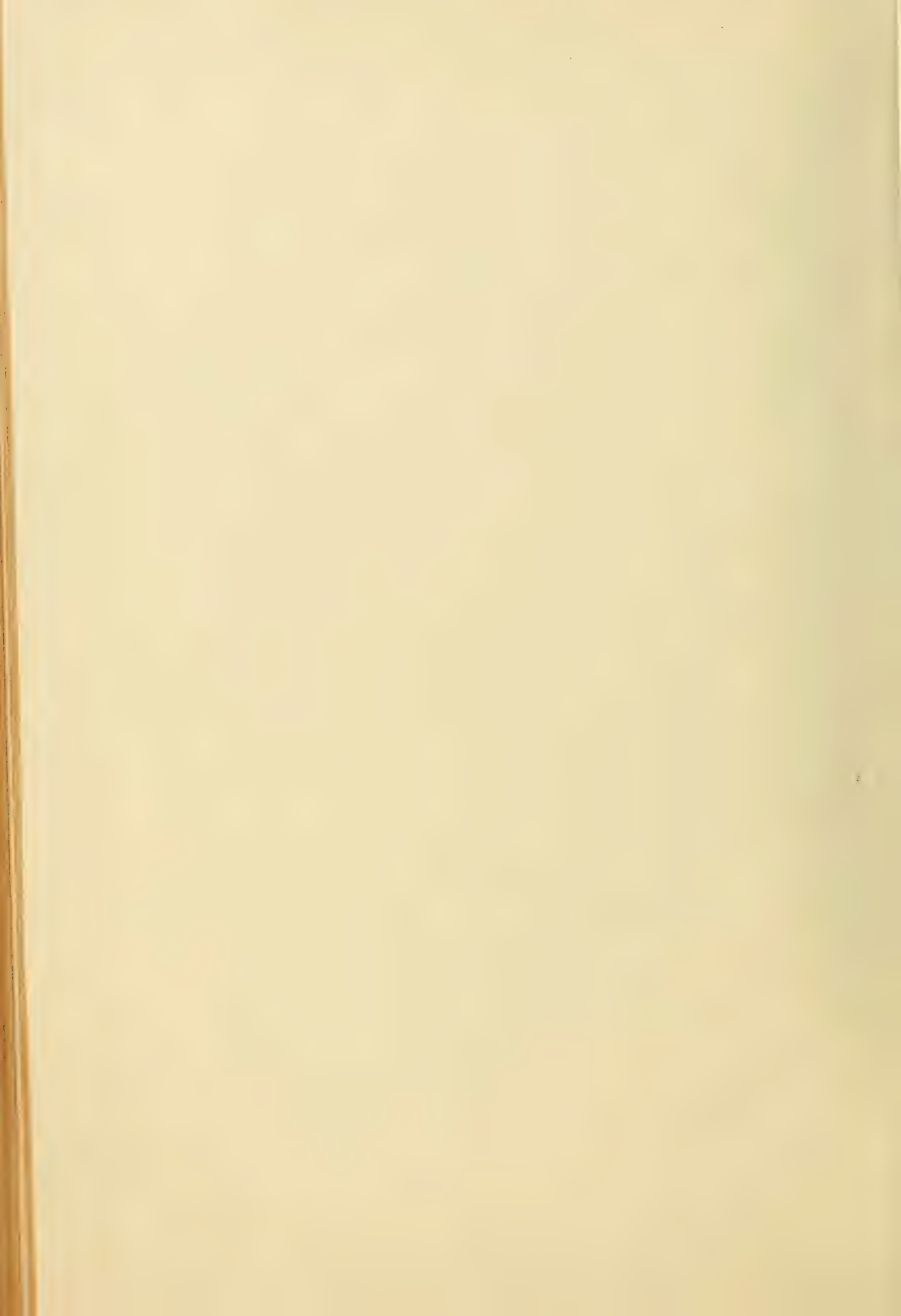
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